



FRIDAY, FEB. 6.

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Contributions.

High Trestles of the Esquimalt & Nanaimo Railway.

VICTORIA, B. C., Nov. 20, 1890.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Inclosed I send drawing of centre bent of trestle at the crossing of Arbutus Cañon on this railway. During the six years that this structure has been under traffic it has remained in perfect line and surface, and has undergone no repairs and cost nothing, save the small expense incurred in tightening screw bolts.

The trestle is on a curve of 10 degrees, and is one of 121 structures of the same class several of which are over 100 ft. high. Its length is 600 ft., and the bent foundations are laid in pits excavated in the rocky sides of the ravine.

As the *Railroad Gazette* has lately devoted considerable attention to timber trestle work, I have taken the liberty of sending you this example of construction in the far West. JOSEPH HUNTER, Chief Engineer.

The Second Expert Report on the Brooklyn Bridge.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Engineering News states in its issue of Jan. 21 that in proposing to reduce the headway of trains on the Brooklyn Bridge to 45 seconds by the Barnes-Martin plan of tail switching, "the Board of Experts has recommended not simply questionable and hazardous procedures, but physical impossibilities."

I have made careful inquiry into the methods which the Board proposes to employ and have satisfied myself by personal observation that by means of these methods the headway of four-car trains can be reduced to 45 seconds. My testimony can add no weight to the opinion of the Board, but I beg your attention to the accompanying diagram and explanation, which, though less ingenious than those of Mr. Leverich, will possibly be more easily understood by the general reader.

Trains from the bridge are delivered alternately to the right and left of the incoming platform. In practice they are run in pairs, with intervals between trains of 20 seconds and 70 seconds, alternately. After discharging their passengers the trains are taken to the outgoing platform in the following manner by engines X and Y. Train No. 1 arrives at B and stands 30 seconds to discharge passengers, and during this time engine Y couples on at B.

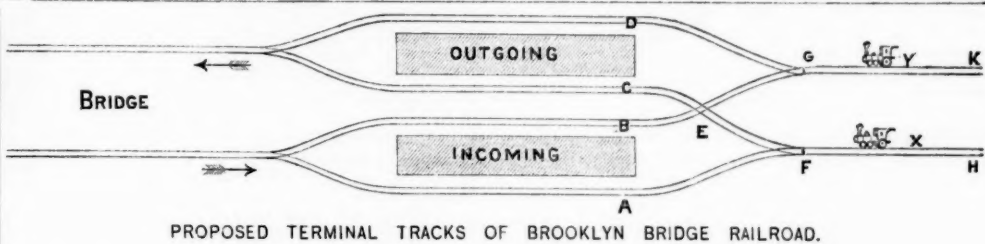
Twenty seconds later train No. 2 arrives at A and stands 30 seconds to discharge passengers, engine X meanwhile being coupled on at A. Ten seconds after the arrival of train No. 2 at A engine Y pulls out with train No. 1 to K, using 30 seconds or less, and then "kicks" the train to D, using 30 seconds or less.

Twenty seconds after the departure of train No. 1 from B engine X pulls out with train No. 2 from A, and runs to H, using 30 seconds or less, and then "kicks" the train to C, using 30 seconds.

After kicking the trains 1 and 2 to the outgoing platform, both engines stop before reaching the switches G and F, and as soon as train No. 2 is clear of the crossing E, the engines pass respectively to B and A.

Thus train No. 1 has consumed 30 seconds in unloading, 30 seconds in passing to K and 30 seconds in passing to D; but add to this 15 seconds that engine Y has to wait at G for train No. 2 to clear the crossing E, and we have a total of 105 seconds.

Now train No. 3 arrives at B 90 seconds after train No. 1, so that No. 3 has been standing 15 seconds before engine Y has a clear track to B. But it requires 30 seconds to unload, so there are 15 seconds left in which to pass engine Y from G to B and couple to train No. 3, an operation which requires less than five seconds. Of course train No. 4 is delivered at "A" 20 seconds behind train No. 3, and then the same switching movement is gone through with as with trains Nos. 1 and 2. At the



PROPOSED TERMINAL TRACKS OF BROOKLYN BRIDGE RAILROAD.

outgoing platform each train stands 30 seconds to load and then departs.

Now one word as to the safety of this plan. As has been stated before, no loaded trains use the crossing. Moreover, the crossing E is interlocked with F and G, so that F and G cannot both stand for the crossing at the same time, and the crossing cannot be taken from one or given to the other till it is entirely clear. It is also evident that there is the less danger of accident in that the movements of the two engines are for the most part in parallel lines. The running of trains in pairs will have another great advantage, since it will admit of loading from both sides of the outgoing platform at one time. The interval during which no trains are standing at this platform will be sufficient to allow the crowd to distribute itself evenly over the entire length of the

platform so as to pass easily through all the gates in stead of choking up those at one end of the trains.

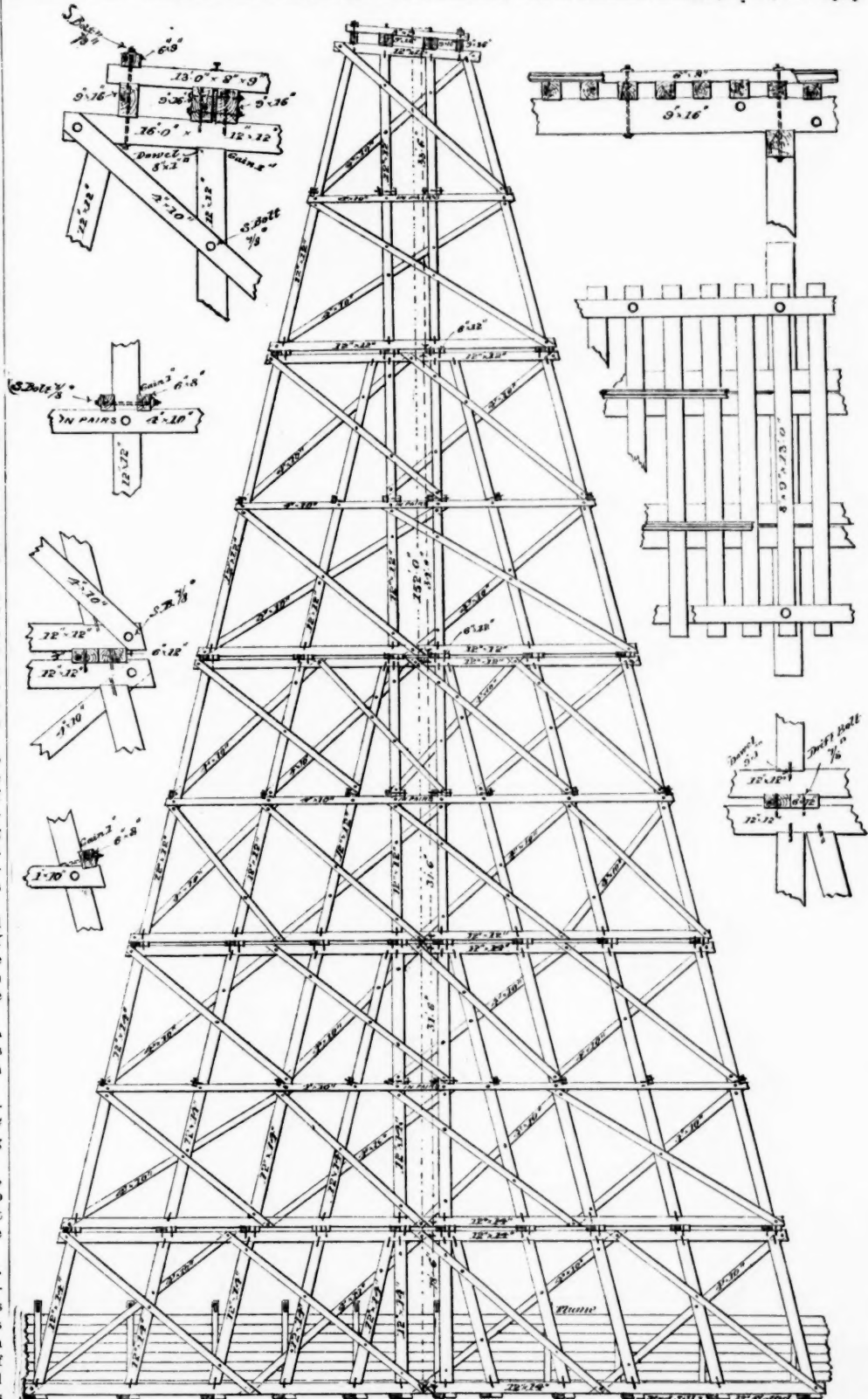
Dot.

The Knotty Problems of Car Service and Demurrage

Western New York Car Service Association }
BUFFALO, Jan. 28, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have noted with great interest the paper on "Car Service," read before the New York Railroad Club by Superintendent Wattson, of the West Shore, and published in your issue of Jan. 23. The idea underlying Mr. Wattson's paper is that the number of cars now in freight service is beyond the requirements of the traffic and that, with an increased mileage per car, the equip-



HIGH TRETTLE--ESQUIMALT & NANAIMO RAILWAY.

ment of the various roads could be reduced in proportion to such increased mileage. This is without doubt a fact, and the problem seems to be how best to increase the average daily mileage. To determine which remedy is best suited to the case, it is necessary to first make a diagnosis of the disease.

During the months of September, October and November last, we were informed daily of the great shortage of cars at all points east, west and south, while at the present time all, or nearly all, the trunk lines are blockaded with loaded cars destined to points east; and I venture the assertion that the consignees of 50 per cent. of this freight are in no hurry for it and would prefer not to have it delivered until they are in need of it. Competition on the part of the traffic departments of the railroads and speculation by the shippers are largely the causes of this state of affairs. I have known cases where, to secure large consignments, the shipper has been promised that he could hold the commodity in cars as long as desired. In other cases an individual

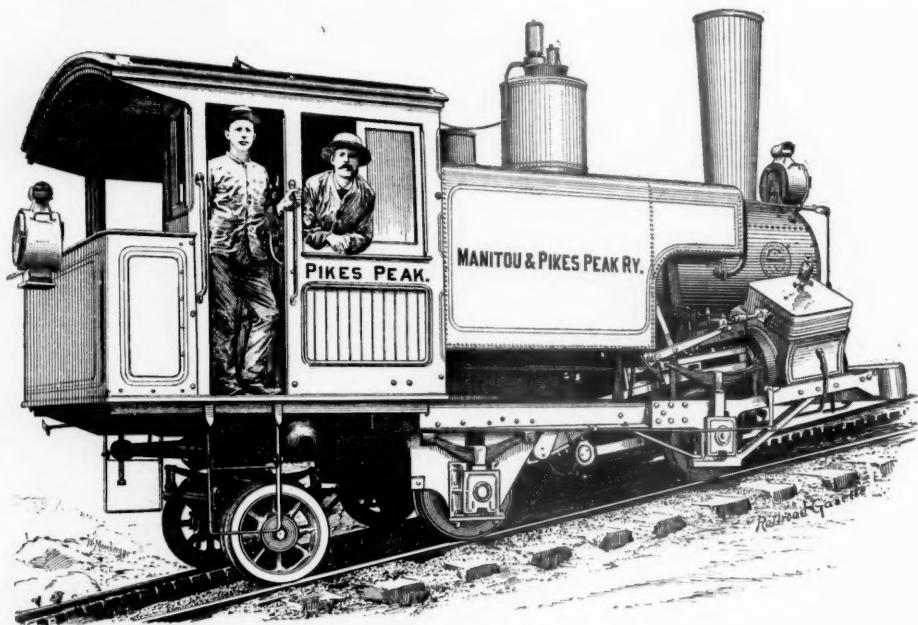
roads interested, and in addition the expense of Car Accountants' offices would be reduced to a minimum, only junction reports being necessary to enable per-diem accounts to be kept with the several roads. It would seem that the Time Convention might take this matter up with profit to the roads interested.

E. VAN ETEN.

Abt Locomotive for Manitou and Pike's Peak Railway.

The most noteworthy locomotive for rack railroads in operation in this country is shown by the accompanying illustrations. The perspective from a photograph gives a general idea of the construction of the engine, while the sections, figs. 1, 2, 3, and 4, show the general details of construction.

This is a tank engine with tanks on the side above the frame, as shown. The coal is carried in a bunker at the back of the cab. The frame is of bar type at the front, and of channel iron at the rear, the back horn block



ABT LOCOMOTIVE.

Built by the BALDWIN LOCOMOTIVE WORKS.

with no capital was able to purchase a large quantity of a certain commodity by getting money on bills of lading issued by the railroads, and then speculating on the price of said commodity, being aided thereto by the connivance of the roads, who would hold the freight in the cars *sixty days*. I have known cases where, to relieve grain from elevator charges, owners have, with the permission of traffic officers, loaded cars, billed them to some through-rate point, and then held them back at some way station *until sold*. Detentions to cars, which invariably belong to another road than the one holding them, average in many cases of this kind 60 to 90 days. Cases are numerous where cars have been detained with "company material," supply coal, etc., 30 to 90 days. These, and similar cases, are the reasons why the average mileage of cars is at such a low figure.

The Master Car Builders' rules recognize the fact that time, and not mileage, is the principal reason for the detention of cars, and a new foreign car could, under the present practices, be used as a storehouse by a railroad (I have known of such cases) for a year without charge, and then, if destroyed—say by fire—would be settled for with the owner for a considerable less amount than if destroyed before being used as a storehouse.

The remedy for these abuses is: 1st, per-diem rental instead of mileage rental; 2d, charges for use of cars and track as now applied by the various car service associations. Is any other property rented in the way cars are now leased? Per-diem rental would do away with the abuse of cars by borrowers. Charging for use of cars and track (demurrage) has already done much good, and when properly applied will do away with abuse of cars by consignors or consignees. If the traffic departments of the various roads, as well as the shipper, knew that charges would be made for use of cars after a reasonable time, the incentive to promise and use cars for warehouses would be gone, and traffic would soon regulate itself to the requirements of each particular business. This has been the experience of car service associations so far, but the application of such charges does not extend far enough to reach the worst cases. All cars billed to terminal or competitive points should be subject, under reasonable rules, to car service charges. All "company material" (which is now exempt in most associations) should be subject to these charges, and the department responsible for the delay should be charged with all car service caused by these detentions.

All this could be accomplished by an equipment company, something about on the plan suggested by Mr. Wattson, much better—for obvious reasons—than by the

being made of a plate riveted to the channel iron frame, as shown in fig. 4. Sections of the channel iron frame are shown in figs. 1, 2, and 4. The rear truck is swinging, with radius bar, clearly shown in fig. 1. The cog wheels which work in the rack placed between the rails are carried in a pair of bar frames placed between the main frames, as shown in fig. 2. The general dimensions of the engines are as follows:

Gauge ..	4 ft. 8 1/4 in.	Water space ..	F. 3 1/4 in., S. & B. 2 1/4 in.
Cylinders ..	17 x 20 in.	Staying ..	Radial.
Drivers ..	22,468 in.	Truck wheels diam.	23 1/2 in.
Total wheelbase ..	11 ft. 8 1/2 in.	Truck journals ..	4 x 6 in.
Driving ..	4 ft. 1 1/2 in.	Driving wheel centers ..	15 3/4 in.
Weight, total ..	53,600 lbs.	Mam axle journals ..	6 x 7 in.
on drivers ..	50,700 lbs.	Div. axle journals ..	7 1/2 x 4 1/4 in.
Boiler diameter ..	44 in.	Support axle journals ..	6 x 6 in.
No. of tubes ..	176	Carrying wheels ..	25 1/4 in. diam.
Diam. of tubes ..	1 1/2 in.	Carrying journals ..	4 1/2 x 6 in.
Length of tubes ..	7 ft. 6 in.		
Firebox length ..	48 in.		
width ..	59 3/8 in.		
depth ..	F. 46 1/4 in., B. 40 1/2 in.		

The service which these locomotives were guaranteed to perform is as follows: "On a road 8 1/2 miles long, ascending say 7,600 ft., and having maximum grades of 25 per cent. and maximum curves of 359 ft. radius occurring in combination with a grade of 22 per cent., each locomotive shall be capable of pushing 42,000 lbs. of cars and lading at a speed of five miles per hour on a grade of 16.33 per cent.; speed of three miles per hour on a grade of 25 per cent.; speed of eight miles per hour on a grade of 8 per cent. In no case will speed exceed eight miles per hour."

The engines in use have from the first performed this work satisfactorily, and we learn that in continued service they are developing still better results in economy of fuel and water.

These locomotives are built on the Abt system, by the Baldwin Locomotive Works. The description of the Pike's Peak Railroad, together with details of operation, were given in the *Railroad Gazette* of April 4, 1890, p. 227.

Connecticut Railroad Commissioners' Report.

Messrs. George M. Woodruff, William M. Hayward and William O. Seymour, Railroad Commissioners of Connecticut, have issued their report for the year ending Dec. 31 last. The statistics are for the year ending June 30, 1890. No new road has been built in the state during the year. The commissioners prefer the form of annual report adopted in 1878, but do not seem to present any very definite objection to the national form lately adopted. Uniformity in the form of returns is not the same as uniformity in bookkeeping, and the latter is

more difficult of attainment. Under the existing law the weak roads can charge too much to construction and the stronger ones too much to operating expenses. If this is to be corrected the commissioners must have more clerical help. The growth in gross earnings is 14 per cent., but this and other increases are largely in consequence of the enlargement of the New York, Providence & Boston by the lease of the Providence & Worcester, which has nothing to do with Connecticut. The actual increase of earnings attributable to growth in business is about one-half of this, or seven per cent. The percentage of expenses on the New York, Providence & Boston has fallen from 69 to 65, and on the Central New England & Western it has risen from 69 to 72 1/4. The latter road in 10 months spent for maintenance of way and structures \$3,000 less than its predecessor, the Hartford & Connecticut Western, with one-third less mileage, spent in two months. The average expense per mile for maintenance of way and structures on all roads reporting was \$2,064, but the New York, Providence & Boston spent \$3,481, and the Central New England & Western only \$209. The average dividend paid was 4.43 per cent.

Brief notes are given of the condition of each company. The Central New England & Western reports that it has now a freight traffic of 2,500 cars per month over the Poughkeepsie Bridge. Six passengers were killed and 30 injured, all of the killed having been guilty of contributory negligence or worse. The total number of employees injured was 335, and in 29 cases these injuries were fatal. Coupling accidents happened to 119 trainmen, of which three were killed. This number is 22 less than for last year. The commissioners recommend that the legislation of the state be amended to conform to the recommendations of the Convention of Railroad Commissioners at Washington, which were to the effect that train brakes be applied to all new freight cars, Master Car Builders' couplers to all cars, and driving wheel brakes to all engines. The state has succeeded in restricting the construction of new highway crossings at grade, but the present legislation looking to the abolition of existing crossings has not yet amounted to much. The legislation of 1889, making the existence of a private or farm crossing *prima facie* evidence of its legality, is pernicious. The law forbidding electric and other street roads from crossing a steam road at grade is, however, good, and has enabled the commissioners to prevent the establishment of some such dangerous crossings.

The law cannot be given the credit for the crossings eliminated on the New York, New Haven & Hartford, as the work was done in pursuance of the company's policy in connection with its new additional tracks. The New York & New England objected to some of the orders of the commissioners because it had had to spend a good deal of money in Massachusetts in abolishing crossings. The commissioners are not inclined to accept such an argument. The act of 1889 empowered the commissioners to order grade crossings abolished where deemed necessary and to assess one-fourth of the expense on the state. This course has been pursued in the case of a crossing in Simsbury and another and dangerous one in Hartford, where the railroad crosses the highway immediately at the entrance of a highway bridge over the Connecticut River. New union stations have been ordered by the Legislature at Norwich and Waterbury, and the commissioners have taken some action in the matter. At Norwich they think no union station is needed, but will, of course, carry out the law. At Waterbury the problem is complicated and has been referred to Clemens Herschel for an expert report.

The Ohio Railroad Commissioner's Report.

Railroad Commissioner James A. Norton, of Ohio, has issued a pamphlet containing that portion of his annual report giving the general remarks, conclusions and recommendations. Commissioner Norton has been in office only since May 1 last, and he says that he has had to establish a system of records, which was before entirely lacking. The annual reports of the railroad companies have been delayed by the time lost in waiting for blanks from Washington, which were prepared in connection with those of the Interstate Commerce Commission. The law requiring a fee of \$1 per mile of track from each road is now before the Supreme Court on appeal. If it is held valid, as the commissioner expects, the money collected under it will support the commissioner's office, which is now hampered by lack of funds.

The commissioner refers to the inadequate law concerning blocking of frogs and investigation of accidents, which it will be remembered were made the subject of special circulars to the roads by the commissioner several months ago. The proposed law for regulating the employment of telegraph operators is more comprehensive than the press dispatches had indicated, and Commissioner Norton seems to have a correct understanding of the requirements of the case.

The commissioner has tested the oils used in lighting passenger cars on a number of roads in the state and, except on the fast vestibule trains, finds most of them inferior, nearly every specimen tested flashing at 120 degrees, or less. The legislature is urged to pass a more definite and stringent law concerning car heating. Ohio is already well supplied with railroads, but there has

land to William Dawes in 1872 for four-cylinder compound locomotives, a form of starting gear is described as follows: "A valve placing at will the steam chests of the low-pressure cylinders in communication with the boiler for starting, or otherwise, the valve being controlled by the reverse lever or any part of the valve gear connected with it, in such manner that it will be open only when this lever is at its extreme position for forward or backward gear and will be closed in all other positions." Mr. Mallet calls attention to the similarity of the Lindner gear to this arrangement.

In the paper several forms of three and four cylinder compound locomotives, which have been recently illustrated in the *Railroad Gazette* are critically examined, as well as the well known Webb type. Mr. Mallet has but faint praise for any of them and shows a full appreciation of their weak points. Following this discussion a description of the Mallet type of bogie, or "articulated," compound locomotives is given. The first of these was built in 1887 for a narrow gauge railroad, and there are

principal dimensions of these locomotives, together with those of a similar engine for the Héruault Railroad, are given in the following table:

ARTICULATED COMPOUND LOCOMOTIVES.

Railroad.....	Decauville.	Héruault.	Central Suisse.	Gothard.
Gauge.....	23.6 to 31.5 in.	Standard	Standard	Standard
Grate surface, sq. ft.....	5.2	18.6	19.4	23.7
Heat surface, direct, sq. ft.....	24.8	70	86.1	100.1
" " tubes, ".....	215.3	753.5	1,259.5	1,561
" " total, ".....	240.1	823.5	1,345.6	1,661.1
Boiler pressure, lbs.....	170	170	170	170
Diam. high-pres. cyls., ins.....	7.4	12.1	14	15.8
low-pres. ".....	11	18.1	21.7	22.8
Stroke of pistons, ins.....	10.2	20.5	25.2	25.2
Diam. of wheels, ins.....	23.6	47.2	55.1	48.4
Wheel base each group, ft.....	2.79	4.76	6.23	8.86
" " total, ft.....	9.18	16.4	20.34	26.66
Weight, empty, lbs.....	20,500	61,720	105,800	145,470
full, lbs.....	25,788	77,140	130,000	187,300
Radius of min. curve, ft.....	59	262	328	492

In concluding his discussion and description of the

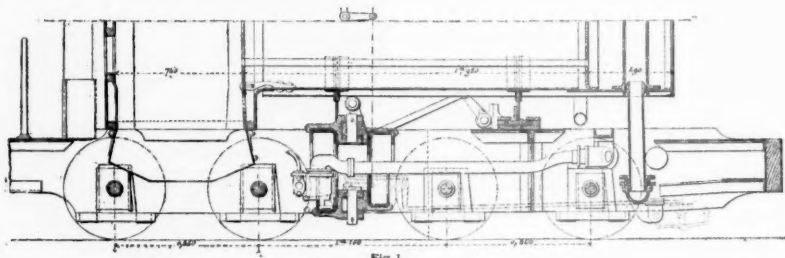


Fig. 1.

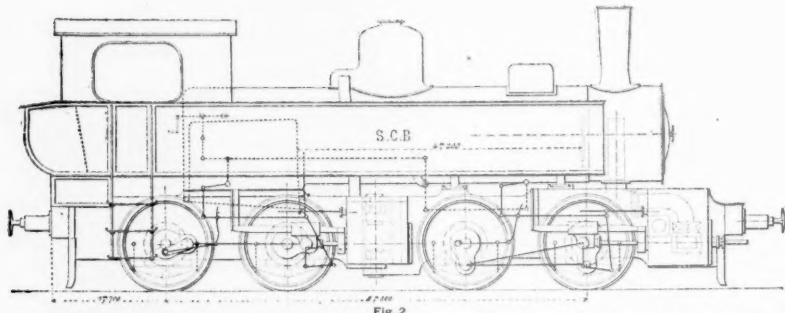


Fig. 2.

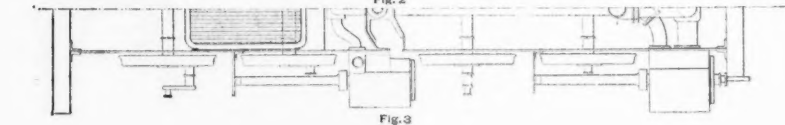


Fig. 3.

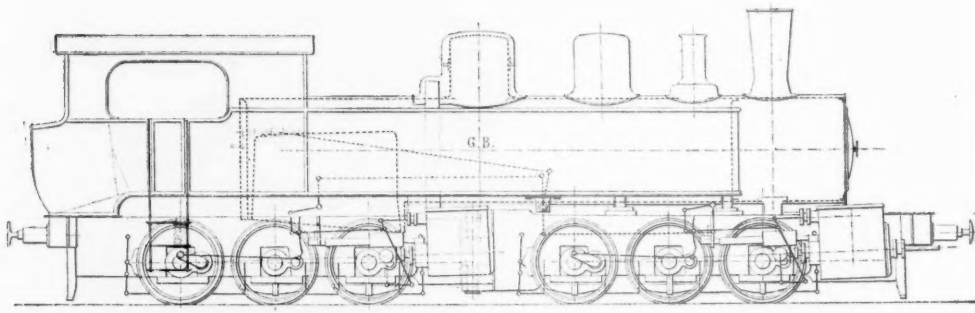


Fig. 4.

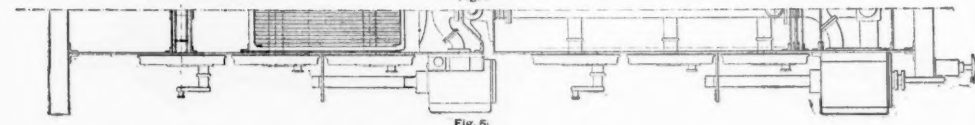


Fig. 5.

MALLETS ARTICULATED COMPOUND LOCOMOTIVE.

now more than 50 of various sizes. The author calls attention to the error frequently made of describing these locomotives as having two pivoted trucks. He says: "There is only a truck in front which is connected by a hinged joint to the rigid part of the engine, consisting of the boiler, water tanks and the frames carried by the rear group of wheels, and to which the high-pressure cylinders are attached, while the low-pressure cylinders are fastened to the forward truck. The advantages of this arrangement are that the high-pressure pipes are fixed, as in an ordinary engine, and that the only movable pipes are the one connecting the two groups of cylinders, containing steam at a pressure of not over 57 lbs., and the exhaust pipe."

The accompanying illustrations, which have been selected from those published with Mr. Mallet's paper, show the principal characteristics of this type of locomotive. Fig. 1 shows clearly the construction of the joint between the two groups of wheels, the connecting steam pipe and the exhaust pipe. Figs. 2 and 3 show the general disposition of the more important parts of an engine for the Central Suisse Railroad, and figs. 4 and 5 illustrate the great St. Gothard engine. The prin-

* January 3, 1890.

various types of compound locomotives, Mr. Mallet states his belief that no one form will be generally adopted, and thus justify those engineers who are waiting, as they say, until practice has demonstrated the permanent type by a sort of condensation of designs, before themselves making use of the system. "At most we may conjecture that the two-cylinder type, which was the first, and which still leads, on account of the simplicity of its construction, will remain in advance, for it can be applied, as we have seen, to nearly all of the cases to be met in actual practice. The design having four cylinders in two separate groups for high speed engines, and the tandem form for heavy freight engines, and, perhaps, even for the preceding engines, will still be preferred by those who object to the want of symmetry between the two cylinders. Finally, the articulated engines have before them a vast field, especially for lines having heavy grades and sharp curves."

The concluding 19 pages of the pamphlet are given to answering the objections raised against compound locomotives, especially those of Mr. Polonceau, in a paper read before the same society. Both papers are worthy of the attention of all who are interested in the subject, but a summary of the discussion is scarcely practicable.

An Irregular Wear of Locomotive Tire.*

The tendency of locomotive tire to wear irregularly, that is, to form flat places, or to wear the tread out of its original cylindrical form, concentric with the journal, is one of the most annoying and expensive of the minor trials to which a railroad master mechanic is subjected. This trouble is aggravated when roads pass through sandy districts. At first sight the most natural conclusion is that the tire varies in hardness, or resistance to abrasion, and this undoubtedly is the cause of a portion of the trouble, but from an extended series of observations the writer is compelled to conclude that a material portion of the trouble lies outside the tire itself. This conclusion has been arrived at from the following observations:

First—The tire of several locomotives showing serious flat places have been slipped around on the centre, then trued up and placed in service. The flat places in every case formed again at the same place relative to the centre, but in a different place on the tire.

Second—Observations made on a large number of tires running in a sandy district showed that the flat places grouped themselves with a close approach to uniformity, occupying nearly the same position with reference to the pins and counterbalance.

The above clearly indicates that there are cases of irregularity in the wear of tire due to the forces which are in action in operating the locomotive, and it is the purpose of this investigation to partially determine the nature, extent and influence of these forces.

For this purpose Engine 316 was taken, the dimensions bearing on the question being as follows:

Diameter of cylinder, 16 in.
Stroke of piston, 24 in.
Diameter of drivers, 62 in.
Total weight on drivers, 54,000 lbs.
Boiler pressure 160 lbs.
Cylinder pressure, 130 lbs.
Cut-off, 6 in.
Speed per hour, 40 miles.
Weight of reciprocating parts, each side, 480 lbs.
Weight of main rods, 239 lbs.
Weight of main rod taken as reciprocating, 117 lbs.

The total weight of reciprocating parts was counterbalanced, the counterbalance being equally divided between the wheels.

With the above data Table 1 has been computed show:

TABLE I.

FORCES IN ACTION ON ENGINE 316 MOVING AT 40 MILES PER HOUR

Degrees.	Weight on rail.					Rotative force at pin.	Ratio of rotative force at rail to weight on rail.
	R. F.	L. F.	R. B.	L. B.	Total.		
0	13,500	19,230	13,500	17,340	63,570	12,910	.081
10	13,216	18,974	12,836	17,282	62,308	15,283	.098
20	12,985	18,702	12,187	17,105	60,979	18,377	.121
30	12,831	18,237	11,580	16,825	59,470	20,467	.137
40	12,742	17,598	11,035	16,441	57,815	22,288	.154
50	12,733	16,811	10,530	15,965	56,039	23,407	.167
60	12,839	15,979	10,175	15,420	54,413	22,378	.165
70	12,052	15,049	9,805	14,813	51,809	17,924	.138
80	11,799	14,079	9,718	14,164	49,760	14,365	.119
90	11,632	13,500	9,660	13,500	48,292	13,793	.112
100	11,578	13,216	9,718	12,836	47,348	15,879	.135
110	11,515	12,985	9,805	12,187	46,612	17,530	.151
120	11,535	12,831	10,175	11,580	46,141	18,733	.163
130	11,599	12,742	10,530	11,035	45,935	20,004	.175
140	11,724	12,733	11,035	10,530	46,051	21,108	.185
150	11,945	12,839	11,580	10,175	46,239	20,222	.175
160	12,228	12,052	12,187	9,805	46,362	16,279	.140
170	12,641	11,799	12,836	9,718	46,994	13,870	.119
180	13,500	11,632	13,500	9,660	48,292	13,793	.112
190	14,575	11,578	14,164	9,718	50,035	15,308	.123
200	15,648	11,515	14,813	9,805	51,961	16,290	.126
210	16,697	11,535	15,420	10,175	53,847	16,938	.126
220	17,641	11,599	15,965	10,530	55,704	17,179	.123
230	18,495	11,724	16,441	11,035	57,694	17,496	.120
240	19,232	11,945	16,825	11,580	59,582	18,105	.120
250	19,408	12,228	17,105	12,187	60,928	18,745	.104
260	19,311	12,641	17,282	12,836	62,070	17,779	.082
270	19,230	13,500	17,340	13,500	63,570	12,910	.081
280	18,974	14,575	17,282	14,164	64,995	14,712	.090
290	18,702	15,648	17,105	14,813	66,298	17,137	.104
300	18,237	16,697	16,825	15,420	67,179	18,672	.112
310	17,598	17,641	16,441	15,965	67,645	19,443	.117
320	16,811	18,495	15,965	16,441	67,712	19,796	.117
330	15,979	19,232	15,420	16,825	67,456	20,261	.120
340	15,049	19,408	14,813	17,105	66,375	17,390	.105
350	14,079	19,311	14,164	17,282	64,836	13,274	.081

ing the forces in action at each ten degrees of a revolution, the zero point being taken as that point at which the right-hand driving wheel pin passes the forward centre.

This table shows in the first column the position of the wheel by degrees. The second, third, fourth and fifth columns show the pressure of each wheel against the rail, with the engine moving at 40 miles per hour. The pressure of the two back wheels varies from 9,660 lbs. to 17,340 lbs or 3,840 lbs. above and below the static load of 13,500 lbs. This variation is due entirely to the influence of the centrifugal force of the counterbalance. The pressure of the two forward wheels is subjected to precisely the same influence from the counterbalance, and in addition to this the angularity of the connecting rod effects a decided modification of the pressure on the rail.

The sixth column, headed "total," shows the sum of the pressures of the four wheels upon the rail. The total pressure varies from 67,712 lbs. to 45,935 lbs., a difference of ten tons. The sixth column is represented graphically in fig. 2. The seventh column shows the pressure against the pin normal to a line passing through the centres of pin and wheels, or the force at the pin tending to produce rotation. This column is represented graphically in fig. 3. The rotative force at the rail can readily be deduced from these figures. The eighth column shows the relation between the forces producing pressure on the rail and the forces which have a tendency to cause the tires to slip. The figures are obtained by dividing the force tending to slip the drivers, or the rotative force at the rail by the pressure on the rail. We will call this ratio the coefficient of slip. It corresponds in form and relation to what is known as the coefficient of friction. If the value of the coefficient of slip is equal to the coefficient of friction the wheels will be on the verge of slipping. Fig. 4 is a graphical representation of these values.

The coefficient of friction between wheels and rails or

* A paper read by Mr. J. N. Barr, Superintendent Motive Power, Chicago, Milwaukee & St. Paul, at the January meeting of the Western Railway Club.

the coefficient of adhesion is given by Haswell as follows:

TABLE NO. 2.
COEFFICIENT OF ADHESION UPON DRIVING WHEELS.

CONDITION OF RAIL.	European practice.	American practice.
Rail very dry.....	.3	.33
Rail very wet.....	.27	.25
Ordinary condition.....	.2	.22
In misty weather.....	.15	.2
In frost and snow.....	.09	.16

These figures are obtained by dividing the horizontal force applied to the wheel at the rail, that is just sufficient to produce slipping, by the pressure of the wheel on the rail and can be compared directly with the values given in the eighth column of Table 1.

We will now proceed to apply the data given in Table 1 to a case of wear taken from actual practice and illustrated in fig. No. 1. The wear is shown by full lines for the right-hand wheels and dotted lines for the left-hand wheels. The depth of wear as shown is exaggerated to prevent confusion of lines, and shows just twice as great as the actual wear. On the forward wheels there are two flat places of about the same size in the same location. This varies from the general results, as in most cases the flat place on the right wheel is much less than that on the left wheel, and there seems good reason to believe that the flat place on the right-hand wheel has been modified by a soft place in the tire.

By referring to Table No. 1 it will be seen that the coefficient of slip at 50 degrees is .167 and that this exceeds the coefficient of adhesion for a frosty rail and that it approaches uncomfortably close to the coefficient of adhesion for ordinary condition of rail. The tendency to slip slightly, or to what is known as imperceptible slip, must be quite decided under these conditions. A corresponding flat place is found on the left back wheel, but the right back shows no flat place. Several cases show some wear on the right back wheel corresponding with that of the left back wheel, but always less in quantity, and in this case doubtless more careful measurement would have shown some wear.

Considering the four flat places as shown in the neighborhood of 80 degrees, why do they vary, always being greatest on the left-hand tire? An inspection of the weight on rail seems to show the reason quite clearly. Table 1 shows the pressure of the four wheels on the rail at 60 degrees to be as follows: L. F., 15,979 lbs.; L. B., 15,420 lbs.; R. F., 12,539 lbs.; R. B., 10,559 lbs., and the average size of the flat places correspond with these pressures. There are two other flat places on these wheels, one on the right back at 200 degrees and one on the left forward at 310 degrees, which can scarcely be accounted for by slips, but are likely due to soft places in the tire. As the speed of the engine increases the coefficient of slip is varied by the increased intensity of the action of the centrifugal force of the counterbalance. A change in steam pressure and cut-off also affect these values.

There is a possibility that further and closer observations, covering a sufficient number of cases to eliminate the question of variation in the hardness of the tire, will develop the following: Flat places will be found near the 60 degrees point, varying as shown above. Flat places will be found near the 140 degrees where the coefficient of slip reaches .185, but much less than the preceding on account of light total pressure on the rail and all nearly of the same size as the pressure of the wheels on the rail are all four nearly equal. Very slight flat places may also be found at the 220 degrees point and the 320 degrees point, which are two other maximum points of the coefficient of slip. It would appear from a comparison of the flat places with the weight on rail that when the pressure does not exceed 11,000 lbs. the tendency to abrasion from imperceptible slip is very slight.

The conclusions to be drawn from the above may be summarized as follows:

1. Flat places on driving wheel tires are not entirely due to lack of uniformity in the wearing quality of the same.
2. The flat places have a tendency to group themselves where the coefficient of slip is greatest.
3. They vary in depth with the pressure on the rail, and when the pressure does not exceed 11,000 lbs. the imperceptible slip produces but little abrasion.
4. Imperceptible slip does not appear at random on any part of the wheel, but in special localities as fixed by the maximum values of the coefficient of slip.
5. The counterbalance should be as light as possible compared with the reciprocating parts, consistent with smooth riding.
6. The weight of the reciprocating parts should be as light as possible.

Foreign Railroad Notes.

The greatest railroad of Austria-Hungary is that of the Austrian-Hungarian State Railroad Co., whose name is due to the fact that long ago, when the empire was desperately in need of money, it sold what was then the state railroad system to a French company. On the Hungarian lines of this company, which have been compelled, through competition, to modify their rates on account of the zone tariff of the Hungarian State railroads, the allowance of free baggage was abolished Aug. 1 last. But so much complaint was made by the passengers that on Jan. 1 of this year this reform broke down, and 55 lbs. of free baggage are now allowed for every full local ticket.

Rumania, Hungary's neighbor on the east, has imitated its zone tariff, the new arrangement having begun March 1 last. The result for the first three months is reported as follows:

	1888.	1889.	1890 over 1889.
No. of passengers.....	514,695	536,258	595,602
Receipts (francs).....	2,366,140	2,574,734	2,724,121

The increase over 1889 is thus 11.6 per cent. in number of passengers and 5.8 per cent. in passenger earnings. The increase in the number of passengers is considerably greater and that in passenger earnings considerably less than from 1888 to 1889, under the old tariff, and compared with the growth of the Hungarian travel,

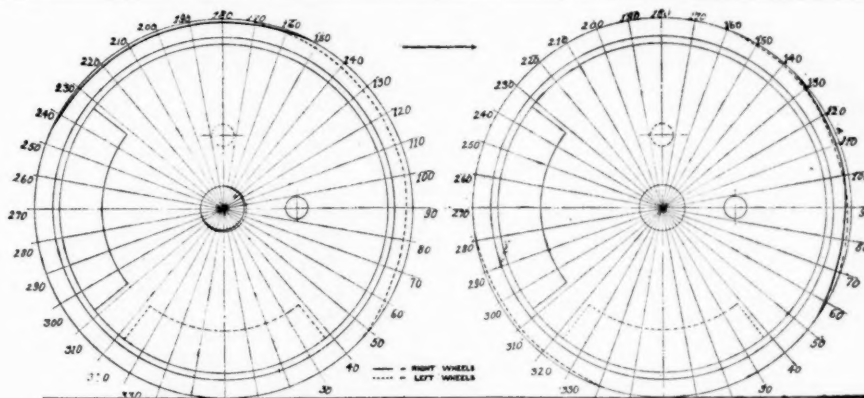


Fig. 1—Showing Wear of Tires.

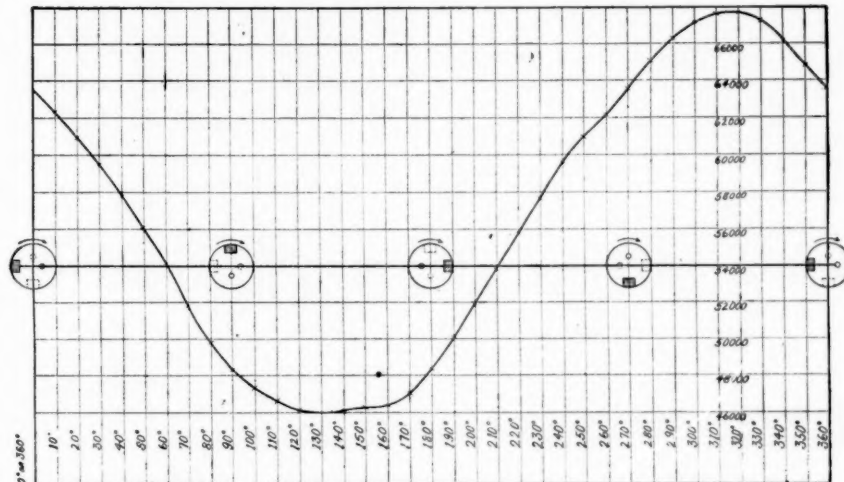


Fig. 2—Showing Total Pressure of Drivers on Rail.

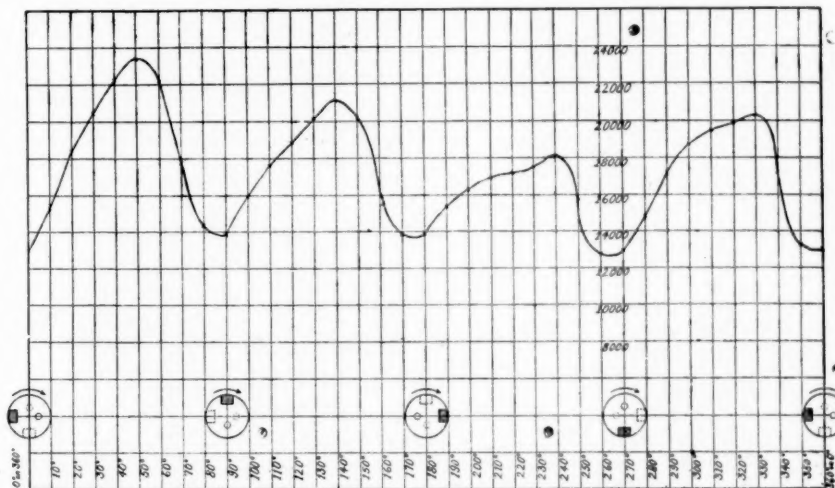


Fig. 3—Showing Force Acting Against Pin to Produce Rotation.

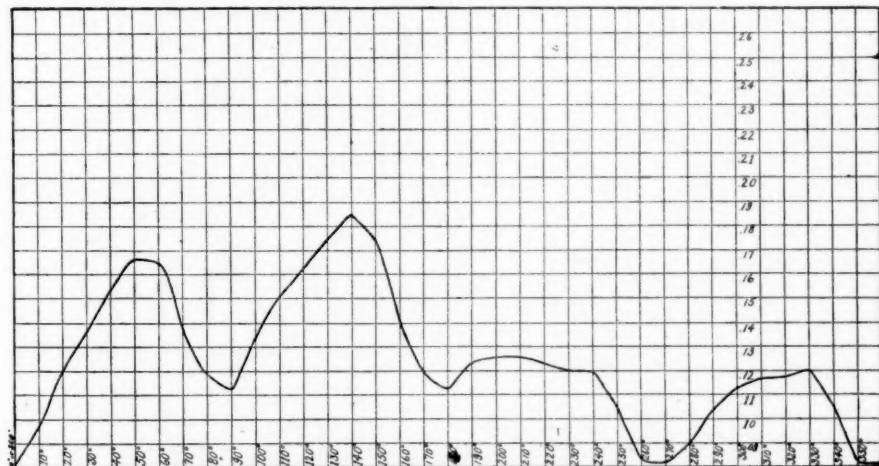


Fig. 4—Showing Ratio of Rotative Force to Weight on Rail.

DIAGRAMS WITH MR. BARR'S PAPER ON WEAR OF DRIVING TIRES.

which has more than doubled, the changes are insignificant.

A writer in the *Journal* of the German Railroad Union considers at great length whether it would be advantageous to introduce continuous brakes on German freight trains. He takes up the arguments for such brakes

which are urged in this country, and concludes that for the most part they do not apply in Germany, where the brakeman cannot run over the tops of the cars; the latter are already coupled tight, and the accidents to freight trainmen are rare. They could not reduce the number of brakemen, he says, because the hand brakes would have to be kept available, and in Germany the

brakeman cannot run from car to car to apply brakes, but must stay on his brake car, and, moreover, the brakemen are needed to assist at the stations when the trains stop. The cost of such brakes, he says, for the whole Prussian State railroad system has been roughly estimated at \$14,000,000.

Buildings and Structures of American Railroads.*

BY WALTER G. BERG.

NO. 13.—CAR SHEDS.

Car sheds are provided on railroads to protect expensive passenger or private cars, when not running, from the weather, and also, as a rule, to allow the cars to be

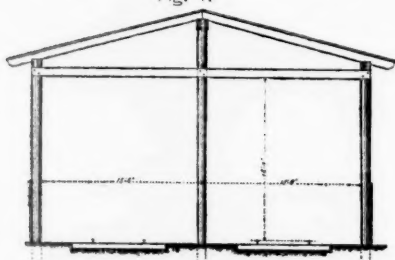
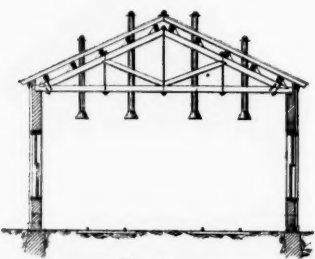
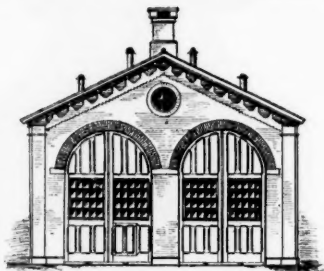


Fig. 2.

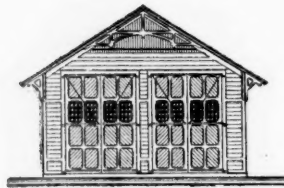


Fig. 3.

car cleaning is to be done, are good light, a convenient water supply, and ample space between the tracks, or between the side of the building and the nearest track, to allow the exterior of the cars to be properly cleaned. It is customary to keep minor car supplies and fixtures in the same building, and to provide space for cleaning carpets, car seats, etc., outside of the cars. In northern climates it is desirable to heat the house slightly in very severe weather.

The illustrations presented below show car sheds with only one or two tracks. Where the length of a building is limited by local circumstances, or the number of cars to be stored is very large, a building with more than two tracks is employed, usually with a light frame roof set on posts between the tracks. For cleaning cars between runs, they are, as a rule, not placed under cover, but switched to so-called car cleaning tracks or yards, where the car cleaners are stationed and platforms, racks, wire nets for cleaning carpets, water supply, etc., are provided. In connection with car sheds or cleaning tracks the palace and sleeping car companies have frequently at the terminals of their routes special buildings for the storage of the sundry supplies connected with the service, including mending and repairing the interior fixtures, furniture, bedding, etc.

The following detail descriptions of car sheds refer to structures actually in use in this country:

Brick Car Shed at Mauch Chunk, Pa., Lehigh Valley Railroad.—The brick car shed of the Lehigh Valley at Mauch Chunk, Pa., shown in fig. 1, was built to accommodate the president's car and the pay car of that road, the former being one of the finest private cars in the country. The building is 34 ft. 2 in. wide, 85 ft. long, and 17 ft. 8 in. high from the floor to the bottom of the tie beams. The walls are brick, 13 in. thick in the panels and 17 in. thick at the pilasters, base and frieze courses. Two tracks, spaced 14 ft. 10 in. centres, enter

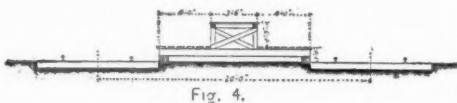


Fig. 4.

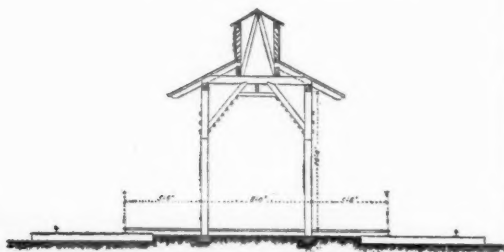


Fig. 5.

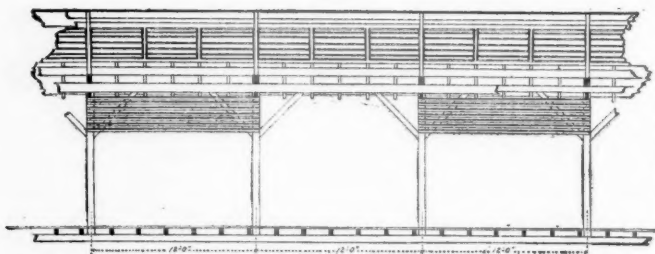


Fig. 6.

STANDARD CAR SHEDS.

cleaned under cover. In Southern sections of the country car sheds are frequently used as a protection against the injurious effects of the sun on the varnish and paint of the exterior of the cars.

Car sheds are not in universal use in this country, so that there is no general standard or system recognized as the best for the purpose. Local circumstances and individual requirements determine the leading features and the choice of the style of the structure. Where new buildings are erected for the storage of surplus cars during slack seasons, or for the cleaning of cars between runs, brick and frame buildings will be found in use. Frequently an abandoned shop, engine house, freight house, or train shed, is pressed into service as a car shed, after its usefulness for other purposes has ceased. Thus, the Pennsylvania Railroad has utilized its former terminal train shed at West Philadelphia for a car shed, since the opening of the new Broad street station in Philadelphia and the practical abandonment of the West Philadelphia terminus. A great many roads make no provision whatever for the storage of passenger cars under cover, and allow expensive cars to stand on side tracks for long periods exposed to the weather and the heat of the sun. More attention should be paid to the comparative cheapness of temporary car sheds, as described more fully below, and to the advantage of using them, where funds are not on hand at the time for a more elaborate structure, or the final location of a car shed in connection with a terminal or shop lay-out cannot be definitely determined.

The essential requirements for a car shed, in which

the house, the clear width of the house being 31 ft. The roof trusses are spaced 14 ft. centres, the dimensions of the principal roof members being as follows: Tie beams, 6 in. x 10 in.; principal rafters, 6 in. x 8 in.; truss braces, 6 in. x 6 in.; tie rod at centre, 1½ in. diam.; tie rods on sides, ¾ in. diam.; purlins, 4 in. x 8 in.; spaced 3 ft. 10 in.; rafters, 2 in. x 4 in., spaced 18 in.; roof boards, 1½ in., covered with slate.

There are small funnels over each track, as shown. The tracks have patented iron stop blocks on each rail at the rear of the house. The rails are laid on ordinary ties bedded in the cinder forming the floor.

Temporary Car Sheds, Richmond & Alleghany Railroad.—The design for car sheds, shown in fig. 2, illustrates a type of temporary sheds used on the Richmond & Alleghany for the protection of their passenger cars, while part of the road was still under construction and the final lay-out of the yards and shop systems at the terminals not fully determined. The plans are self-explanatory, and show how cheaply and easily adequate protection for expensive cars can be provided.

Frame Car Shed at Wallula, Wash., Northern Pacific Railroad.—The car shed of the Northern Pacific at Wallula, Wash., shown in fig. 3, is a frame structure 40 ft. x 200 ft. out to out, and about 20 ft. height of frame. There are two tracks, spaced 17 ft. centres, running through the house, which enter at each gable end through two pairs of large, square engine doors, the door openings being 14 ft. wide in the clear and 18 ft. high in the clear above the top of the rails. The roof trusses are spaced 20 ft. centres. The principal timbers used are as follows: Sills, 10 in. x 10 in.; posts, 10 in. x 10 in.; studs, 2 in. x 4 in., spaced 24 in.; plates, 6 in. x 10 in.; rafters, 4 in. x 10 in., spaced 24 in.; tie beams, 6 in. x 10 in.; ridge purlins, two pieces, each 4 in. x 6 in.; purlin braces and purlin posts, 4 in. x 8 in.; roof boards, 1 in., covered with shingles; floor, 2 in. plank; floor joists, 2 in. x 12 in., spaced 24 in., and bedded on 6 in. x 6 in. mudsills; outside of frame sheathed with weather boarding; doors, 1½ in. x 10 in. frames, covered with ¾ in. tongued and grooved boards.

Car Cleaning Platform at Jersey City, N. J., Central

Railroad of New Jersey.—The car cleaning platform of the Central Railroad of New Jersey, at Jersey City, N. J., shown in fig. 4, is built between the tracks of the car cleaning yard and consists of an open platform, 11 ft. 6 in. wide and 8 in. above the top of the rails, with a raised rack at the centre for piling and cleaning the car furniture and fixtures. The rack is 42 in. wide and 21 in. above the platform. It is slatted on top, so as to allow dust and dirt to drop to the ground. The tracks at this point are spaced 20 ft. centres. The dimensions of the lumber are as follows: Blocking, 6 in. x 6 in.; floor joists, 3 in. x 6 in.; flooring, 2 in.; posts, 3 in. x 3 in.; plates, 3 in. x 3 in.; slats, 1 in. x 3 in.; X-braces, 1 in. x 3 in.

Car Cleaning Platform Shed at Jersey City, N. J., Pennsylvania Railroad.—The car cleaning platform shed of the Pennsylvania, shown in figs. 5 and 6, was built in the latter part of the year 1890 for the use of the Pullman Car Company at the special cleaning and storage yard for that branch of the service at Jersey City, N. J. There are several lines of these platform sheds, located between tracks spaced 24 ft. centres. The important feature of the design is the prominence given to the arrangements for allowing the linen and bedding to be properly aired under cover alongside the cars. The illustrations show racks provided for this purpose in every other opening of the shed, and there is a longitudinal hanger beam under the louvered ventilator on which blankets, rugs, carpets, etc., can be hung. The principal sizes of lumber used are as follows: Posts, 6 in. x 6 in.; plates, 4 in. x 6 in.; ties, 4 in. x 6 in.; kneebraces, 4 in. x 6 in.; jack rafters, 2 in. x 4 in.; roof, 1 in. boards covered with galvanized corrugated iron; longitudinal hanger, 2 in. x 8 in.; brace under same, 2 in. x 3 in.; slats of rack, 2 in. x 3 in. The louver is built of posts, 3 in. x 3 in.; braces, 2 in. x 3 in.; ridge plate, 3 in. x 4 in.; plates, 3 in. x 4 in.; louver slats, ½ in., and frame, 1 in.

Central Railway Club.

The annual meeting of this club was held in Buffalo Jan. 28. Officers for the ensuing year were elected as follows: President, Eugene Chamberlain, New York Central & Hudson River; Vice-President, Fred B. Griffith, Delaware, Lackawanna & Western; Secretary and Treasurer, James Macbeth, West Shore; Assistant Secretaries, Harry D. Vought, *Courier*; W. E. Corcoran, *Express*.

Mr. E. D. Bronner told the meeting about the following rules recently adopted by a meeting of roads centering in Detroit:

- Loaded cars will be accepted as follows:
 - I. With four-hole centre plates having one effective bolt.
 - II. With two-hole centre plates having one effective bolt. Centre plates must be in good shape, and equipped with long solid centre pins passing through the body bolster.
 - III. Cars equipped with short centre pins resting in the upper plate must have three effective bolts in four-hole centre plates and two effective bolts in two-hole centre plates.
 - IV. Empty cars must have all centre plates in, except where cars are en route home.
 - V. Four-hole centre plates may be accepted with two corners broken. Two-hole centre plates must be whole.
 - VI. In cases where all bolts are broken and the plate cannot be strapped or clipped, the cars must be referred to the joint inspector. This refers to perishable, bonded or inaccessible loads, or where damage is liable to follow shifting of the load or opening of the car.

The Buffalo club rescinded its former action, and adopted these rules after amending Section 1 so as to make it read: "Centre plates with four holes to have two effective bolts in a diagonal position," and Section 2 so as to read: "Centre plates with two holes to have two effective bolts."

The meeting voted to accept the report of its committee recommending that automatic couplers be received in interchange with the following defects:

Limits of breakage top and bottom of the horn 1½ in. vertically down or up and 2¼ in. horizontally from the outer edge of the guard, provided that 5 in. of metal remain. A breakage of 2½ in. on the vertical line and horizontally, provided that both top and bottom corners are perfect.

Three inches on a vertical line and 1½ in. horizontally in the back of the drawbar.

Fracture front wall of drawbar proper 3 in. horizontally, and ¾ in. vertically, as shown in the top, bottom, and throat of rib.

Of the extending lug of the vertical plane drawbar, of which the knuckle is pivoted, a chip of ¼ in. vertically and ¾ in. and 3 in. transversely. The knuckles must not be broken or chipped in any manner.

In the Gould coupler, where the rib in front of the locking-dog is bent inward so as to prevent the dog dropping, excepted, if the rib is chipped off so as to allow the dog to drop into position.

After the meeting there was a banquet at the Hotel Iroquois, at which ladies were present.

Flexible Metal Hose for Air Brakes.

The *Organ für die Fortschritte des Eisenbahnwesens* explains a novel design for air brake hose, which is shown in the drawings herewith. The movable hose pieces are formed by circular overlapping discs of thin, flexible metal soldered on the outer and inner circumferences and by intersecting conical discs (see fig. 1), every other one of which has flanges alternating; the flexibility of the pipe is thereby increased. The change of form shown in fig. 2 is made by insertion of a former increases the durability.

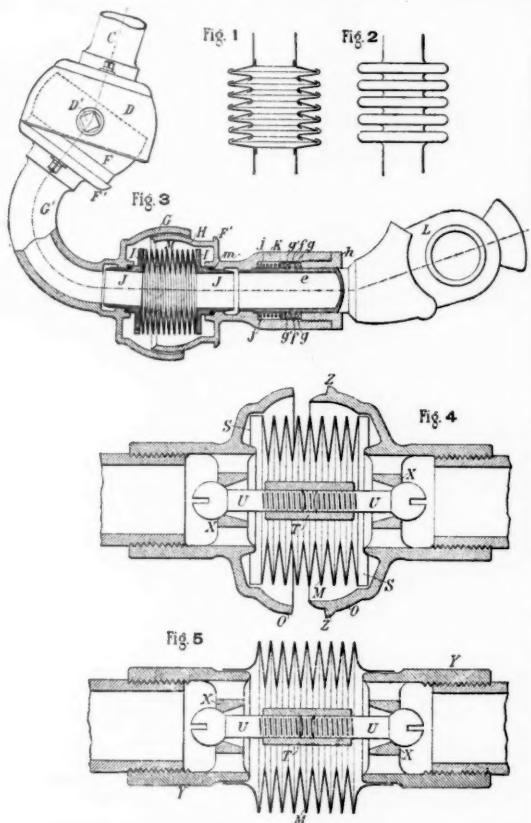
Fig. 3 shows the end of the joined stiff pipes. Above the curved piece *G* is a second joint with a flexible connection insert *I*, while on the upper end is arranged an air-tight ball joint made only of rigid parts. Between the flexible connection and the coupling is placed a stuffing box *K*, while in the coupling *L* is firmly mortised a small pipe *c*; this has the space *f* for reception of the packings *g* and *g'*.

The stuffing box *K* carries one guard of the joint, and the flexible connection *M* is fixed on the discs *I* of the small bushings *J* provided with small packings *m*, and can be set up by a screw. The curved piece *G* is connected with a stiff coupling pipe *C* by another flexible coupling, as shown. Both of the shells, *G H* and *F D*, are held by trunnions, consisting of screw pins, whereby the desired movement is insured and the movable pipe

*Copyright 1890, by Walter G. Berg, and condensed from a forthcoming book on the subject.

is relieved of strain. The flange *F* limits the angular turning of the guards *G* and *H*.

A modification of this train connection is made by a copper rod in the axis of the pipe, as shown in figs. 4 and 5. The angular movement is limited by the shells *O O*. The pipe *M* is so mortised into these shells that the connection is made by the interior pressure upon the surfaces. The connections are held by the ball-headed screws *U U*, in the coupling *T*, and a connection



FLEXIBLE METALLIC CONNECTION FOR AIR BRAKES.

of the shells by pivots is therefore unnecessary. In fig. 5 there are no ball shells, and the flexible pipe *M* is soldered, in a manner suitable for a suction pipe, about the junction pieces *Y* screwed upon the pipe. The protection of the bend pipe may be necessary in such cases and is accomplished by a covering of soft, flexible and water-tight stuff.

Vertical Plane Couplers and Air Brakes.

Mr. MARSHALL: One can hardly select any two subjects which are of more importance to day to the mechanical and operating departments of the railways of this country than the two considered in the paper read at the last meeting of the Western Railway Club. The great amount of money being invested in brakes, together with the fact that they are now being for the first time extensively used in freight service, are sufficient reasons for a closer study of the apparatus and its practical workings. And so with the vertical plane coupler: it is now used in such numbers that a wider experience is being obtained, and from day to day facts are being brought to light which need to be considered by every one interested. In view of all this, the exhaustive paper presented on the subject at the last meeting was very opportune, and should lead to a discussion in which much that is valuable should be added to the information that is already presented.

The Westinghouse Company, being the pioneer in this field, has had to encounter much opposition to the realization of a maximum efficiency of brake power, which has arisen from the carelessness or ignorance of both officials and trainmen, and that company has worked diligently to educate all concerned and to correct the bad practices still to be found on some roads. There is much remaining to be done in this direction, however, and it is to some of these bad practices I wish to refer to-day. Leaving out all consideration of the points raised in the paper presented at the last meeting, as many of those concern the manufacturers more directly, it may be briefly stated that a complete and perfect air brake apparatus consists of a pump which will supply the necessary amount of air at the proper pressure to the main and auxiliary reservoirs; a governor which will promptly stop this pump as soon as the maximum air pressure intended to be carried has been reached; the usual reservoirs and triples connected to an air cylinder whose piston has the proper amount of travel in applying the brakes, and a series of levers under each car so proportioned that the pressure of the shoes upon the wheels will be the greatest which is possible without sliding the latter. It will be seen that in this statement I have not gone into details and have passed over most of those features of the mechanism which comes from the manufacturers ready for use and on which there is no call for adjustment in any way.

What then are some of the bad practices which produce the slid flat wheels? Perhaps one of the greatest is inattention to the pump governors. It is evident that the use of 90 per cent. of the weight for braking does not leave a wide margin for inaccuracies in air pressures carried, and therefore the pump governor must be attended to if there is to be an absence of flat wheels.

The practice of carrying pressure in the train pipe which is in excess of the standard of 70 lbs. is bad from every point of view. But one of the chief sources of

trouble is when, in the course of regular passenger business, such a road receives coaches from a line whose air brake practice is correct. Before these coaches arrive at their destination their wheels are all slid flat because of the high air pressure so carelessly employed.

Another resort for preventing excess pressure when the governors are working imperfectly is to put a safety valve on the main reservoir or some of its connections. This is only another case of a preventive applied at the wrong place, and has this disadvantage, that it prevents a high reservoir pressure being obtained when necessary for the release of the brakes.

There is one other wrong practice which is not met with very frequently, but which causes flat wheels whenever it is permitted. If, when the slack in the gear is adjusted, the piston travel is made very short, the pressure obtained in the cylinder when only 70 lbs. of air is carried in the train pipe and auxiliary reservoirs is much greater than that calculated upon when deciding the leverages. Before leaving the subject it may be well to point to one or two improvements which the general introduction of freight brakes will make desirable. One is the automatic adjustment of the slack in the brake gear. Another improvement which will certainly be inaugurated in the future is a means for varying the brake power with the load.

COUPLERS.

In taking up the question of couplers, the first matter to which I wish to refer is the wear. We all know that couplers of the M. C. B. type wear quite rapidly in passenger service, and the figures given in the paper read last month represent about the average results obtained in this service. The figures given for the wear in freight service are, however, very far from right, in my opinion. On the face of it, it appears as though the author had studied couplers in passenger service, and based his remarks in regard to freight couplers upon the information thus obtained. If such is the case, a greater mistake could hardly have been made. The conditions are entirely different. In passenger service the couplers are always held in firm contact with each other by the spring buffers, and every movement means a grinding away of the face of the knuckles. The speed is greater, and there is also a greater vertical movement and more swaying of the cars in passenger service, while the greater length of the coaches causes a greater wear when passing curves. The connections of the coupler to the car are better fitted, and consequently there is less movement of it in its fastenings. All these things tend to make the wear much greater in passenger than in freight service, and the result of any observations in regard to the one are not applicable to the other. All my observation and all the information I have been able to gather certainly go to show that the excessive wear mentioned in the paper last month does not occur in usual practice.

On a road entering Chicago there is a gravel train having 17 gravel cars equipped with vertical plane couplers since 1887. Though they have been in use between three and four years, the couplers are still in first class condition and an inspection made within a week has shown that they have not worn much more than $\frac{1}{16}$ of an inch at any point. It must be remembered that gravel is continually sifting down on these couplers, thereby increasing the wear. An exact mileage of the train has not been kept, but I am informed that it has been running every day of the year except Sundays and legal holidays and the estimated mileage per day is 60. At that rate the couplers had made from 54,000 to 60,000 in this trying service.

I have within the last two weeks examined a large number of couplers on coal cars which have been running together much of the time for the last six or seven months and the wear is almost unappreciable; and within the same time I have inspected about 10 long stock trains, about 40 per cent. of the cars of which were equipped with M. C. B. couplers, but I have not found more than $\frac{1}{16}$ wear at any point.

There is one very interesting point in connection with what little wear has been noticeable, and that is the fact that the contour was not materially altered in its general outline by such wear. The wear is entirely different from that of passenger service. Instead of wearing off to the wedge shape shown in the diagrams accompanying last month's paper, the freight coupler seems to be almost as well hooked after the wear has taken place as when new. What might be called the ball on the inner face of the knuckles is in many cases as pronounced as at the start and in no case have I seen it worn away entirely. Then, again, the freight coupler wears more nearly even on the vertical surfaces because there is no drop at its outer end. In passenger service, the camber of the car and the drop of the end platforms cause the knuckles to wear more at the bottom than at the top. I have seen passenger coupler knuckles which would have made 100 per cent. more mileage if they had worn evenly.

The claim is made that there is an urgent need for settling the amount of wear which will be permitted on couplers received in interchange. Where is the great need of it at present? Passenger service will take care of itself, for there are no interchange rules in general use for that service, and each road or system must decide for itself. A good many of them have already virtually settled it for themselves. On the other hand, it will probably be three or four years before a freight coupler will be worn sufficiently to be dangerous and there is, therefore, plenty of time to gain in experience and settle this problem upon a more intelligent basis than would be possible at present. Moreover, if it should finally prove true that freight coupler knuckles do not wear to the wedge shape thus far assumed, there will be cause to modify the arguments and figures based upon that assumption. There is plenty of time to settle this question aright.

One word about the strength of couplers. It is not just to credit the present malleable bars with a tensile strength of only 80,000 lbs. That figure was all right for a year ago when many manufacturers had not found out that their bars were weaker than a link, but to-day the case is different. All reliable manufacturers have strengthened their couplers. I recently dropped in unexpectedly on some parties making tests of their bars, and actually saw a bar stand 120,000 lbs. It was not steel either, but simply good malleable iron. Unless steel can be made more uniform and reliable than that at present employed for knuckles it will hardly prove desirable for bars.

The conformity to contour lines is a matter which I believe should be allowed to settle itself as far as possible. Nearly every coupler now made is on the lines, and if a firm with sufficient business sagacity to get a good coupler in extensive use decides that it will vary somewhat from the lines, you may be sure that the subject will be carefully considered by them, and that in all events they will soon be out of the field if they put in service a coupler whose lines give trouble. It is their own lookout and cannot cause railroads much trouble.

Mr. RHODES: If there is so much slack in the close coupler,

and slack has no material effect on the brake, why not start in with the link and pin at once on all new passenger cars? If the brake works in a sufficiently satisfactory manner on our fast express freight trains with link and pin coupler of 40, 50 and 60 cars to the train, we certainly may expect it to work without any criticism on our 5 to 10 car passenger trains. It is not necessary to carry a large variety of M. C. B. bars in stock. All it is necessary to carry is the knuckles. One M. C. B. bar of any make, conforming to the strength requirements of rule 16, is all that need be carried. As to long and short cars coupled together, we have that difficulty with engines in yards now, but we do not condemn the engines.

At our March meeting of last year it was stated that by ignoring the M. C. B. lines it was possible under certain conditions of wear to render the coupler an insecure one. I am glad the author has given this matter such prominence in his paper. At times I have thought that some of the manufacturers did not really understand the points which make that type of coupler meritorious. A short time ago some vertical plane couplers were being introduced, in which the slack seemed to be ignored entirely. I know one coupler in particular that not long since was being put in service with $\frac{1}{4}$ in. of slack. As I understand the diagram, the average of free slack in the link is 2 in. Mr. Rhodes here referred to the report in the *Railroad Gazette* of Aug. 6, 1886, showing that at the Burlington tests there was $3\frac{1}{2}$ in. of slack as against the 2 in. given in the paper.

I think that the vertical plane coupler is essential to the successful working of the air brake. Mr. Rhodes referred to the disastrous results of "break in twos," and said a large share of such accidents were caused by links breaking, pins jumping out, etc. For the last three years the Burlington road has never put on an air brake without putting on a close coupler.

It is not surprising to me that those interested in the introduction of brakes should urge that the vertical plane coupler is not essential to the brake's success. In 1882 one never heard that the vertical plane coupler was essential to the brake's success, yet there were then 1,100 cars fitted up with the air brake. In 1884 there were 21,990 freight cars equipped with the brake. In 1886, the year of the brake tests, we find there were 40,563 freight cars equipped and running with air brakes and fitted up with link-and-pin couplers; and I never heard of an accident occurring by any bad working of the brake owing to the link slack on those trains. It is true that great improvements were made in the brakes afterward. . . . I have not heard of any tests made with 50 cars with the link-and-pin, and quick-acting brakes, and until they are made shall be skeptical on that matter.

I think the vertical plane coupler has come to stay, and any one using the best forms need not worry as to its ultimate success. The most successful way to introduce a continuous air brake is in connection with the M. C. B. coupler. Objection to slack never developed until the M. C. B. brake tests brought it out. Railroad men and manufacturers were perfectly satisfied with the condition of these questions as they existed prior to 1886.

Mr. VERBRYCK: No one claims that the air brake won't work with the link-and-pin coupler, but I think that the greatest efficiency of the brake is obtained with the close coupler. We have 100 cars equipped with the automatic brake and link coupler that have been running several years, and not much fault has been found with them; but they are not handled as efficiently as the cars with the vertical plane coupler. I think that the meaning of Mr. Rhodes' remarks, and I agree with him in that. The M. C. B. contour lines should be strictly adhered to. I have refused couplers that were off from the M. C. B. lines.

Mr. HERR: The effect of spring slack can hardly be settled by a trial of individual cars. Even if the brakes do not act promptly, the first five or six cars will be caught up before the springs receive any compression to amount to anything. Toward the end of a long train is where we begin to get the severe compression of springs, due to the change in the velocity of the cars. Therefore, instead of having but 2 in. per coupler or 4 in. per car of slack, to take an individual case, we would perhaps have from 60 to 80 inches of spring slack available to destroy the energy in the following cars; and the effect would be very much different than if this slack was loose or free slack. I think the diagrams on pages 110 and 111 of the Proceedings for December, showing the comparative amount of energy stored in a moving car and the amount that would be absorbed in the springs, have a tendency to mislead. The amount of spring slack for cushioning a train moving at three miles an hour is not found in the cars themselves, but in cars ahead of it.

Mr. BARNES: The theory of conservation of energy is that you can use that slack only once, and after it is used that ends it. In the Burlington tests there were $3\frac{1}{2}$ in. of link slack. The cars used were comparatively new and probably the draft rigging was in fairly good shape. Follow out the argument in the paper and give one $3\frac{1}{2}$ in. slack and the other $\frac{1}{2}$ in. slack, and the reason is seen why there was not more shock. Mr. Marshall says my paper deals with points that concern manufacturers more particularly. I cannot admit that, because whatever affects the device affects the users more particularly. The basis of wear for freight couplers was not taken from passenger cars. I cannot see in passenger service that turning curves grinds the knuckles so as to increase the wear, except at points where they are not worn on tangents. The more couplers are run upon curves the less wear they will show at points where they are worn on tangents. The wear of the guard arms in passenger service is clearly to be seen by any one who will inspect them. Mr. Marshall has omitted to consider the small amount of wear per year which will finally destroy a vertical plane coupler within a reasonable time. For instance, if even $\frac{1}{4}$ in. is allowed as a maximum wear, and a coupler is given the life of the car, that is, 12 years, the amount of wear per year is but $\frac{1}{48}$ in., an amount that might be deemed inappreciable. Now, when that has been multiplied several times it becomes appreciable. It takes but $\frac{1}{2}$ in. each year to wear them out in six years. Mr. Marshall says there is no need of settling the amount of allowable wear. There is every need of it. One road may say it shall be $\frac{1}{4}$ in. and another $\frac{1}{2}$ in. Immediately upon reaching an exchange point the first mentioned cars will be thrown out. It is not a question of optical observation—it is too small for that; there must be measurement. Only yesterday I saw a car that had run less than a thousand miles and by actual measurement the coupler knuckle was $\frac{1}{4}$ in. out of position. If that does not show the need for a limitation as to the amount of opening in knuckles, I don't know what does. No car inspector could ever determine the condition with his eye.

In considering damage to cars by shock we must con-

* Discussion at the Western Railway Club, January meeting, of Mr. Barnes' paper, read at the December meeting.

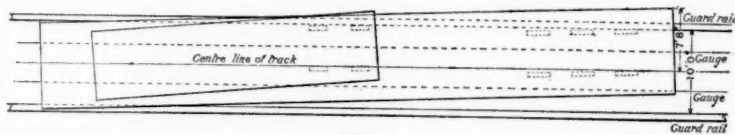


Fig. 2.

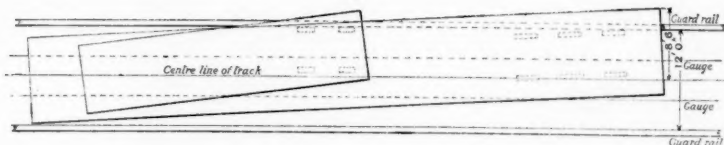


Fig. 3.

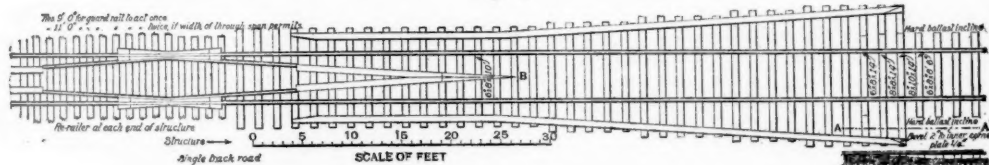


Fig. 4.

GUARD RAILS ON BRIDGE STRUCTURES.

and, with special care from section men, they could be maintained to support 14 ft. ties for a short distance. The bridge, in this figure, extends from the left of the drawing to the end of the arrow, the re-railers being located so as to bring their outer ends even with the end of the bridge. The ties supporting the outer ends of the flaring guard rails are beveled so as to make the ascent from the sloping ballast as easy as possible. In this drawing the inside guard rails on the bridge and also parts of those of the V are shown of wood, but of course they can be made of steel or of wood plated with metal.

The advantages of inside guard rails are numerous. They can be lower than outside guard rails, by the depth of the wheel flange and coning, and still be equally effective. Assuming the sum of the flange and coning to be $1\frac{1}{2}$ in., an inside guard rail 4 in. deep is equal to an outside rail $5\frac{1}{2}$ in. deep. Some adverse allowance in the case of inside guard rail to be made for the rounding of the flange is offset by the climbing tendency on an outside guard rail due to the coning. Again, the sharp cutting edge of the tread bears against an outside rail, giving the wheel a better chance for getting a hold and climbing than is afforded by the smooth flange against an inside rail. An outer guard rail retards the lagging wheel of the pair, and increases the angle. An inside rail retards the forward wheel and brings the course of the pair more nearly parallel to the track. For those who wish to use long ties and wide floors, each of two inside guard rails can be counted on to act twice, except in narrow through bridges. The wheel, having jumped the nearest guard rail, bears against the inner side of the other one. For this purpose 11-ft. ties are sufficient.

It is doubtful whether this second line of defense is needed sufficiently to justify the cost of the longer ties and their jack stringers. The latter are of little help in assisting the main stringers, and the main stringers should not be lessened in size because of the jack stringers. The latter are too remote from the track rails to carry much of the weight; both the elasticity of the tie and the curl of the tie make the assistance of the jack stringer unimportant.

Very widely spaced guard rails in through bridges, especially the narrow wooden spans used on cheaply built roads, give opportunity for another serious mishap. They permit the car body, in some positions in derailments, to strike the truss members. Figs. 2 and 3 will illustrate this. The larger rectangle represents a passenger car body and the smaller a freight car. There are probably hundreds of bridges where this accident is possible, and where the attempt to increase the safety by widening the bridge floors and increasing the space between guard rails has totally removed such safety. In no place is a narrow floor system, with train motion confined closely to the track, so desirable as in a through bridge. In many of these bridges such a thing as a guard rail practically does not exist; the truss would be demolished before the guard rail could be touched by the wheel and become operative.

If a close guard rail of common rail (which, for sake of distinction, might be called a flange guard rail) be desired, it can be used by moving the other guard rail nearer centre of track and by making proper mechanical arrangements near the re-railers. The flange guard rails are nothing more than guard rails only about an inch high, and with the disadvantages that within this inch are a rounded flange and a rounded rail head to lessen the effective height. They are not a sufficient guard rail. There are some drawbacks in their use. When they have failed to be effective, and wheels have become derailed, they become sources of danger. The wheel that is off on the outside of the track rail is traveling a rough road on the ties while its companion is traveling on the smooth flange guard rail. The latter will travel faster and the wheels be turned to a more dangerous angle with the track. Again, with a forward wheel derailed and on the ties inside of the flange guard rail, and the following wheel between the two rails, there is danger of breakage and accident. ARCHIBALD A. SCHENCK.

Russian Railroad Homes.

To celebrate the twenty-fifth year of the reign of the Czar Alexander II. the Russian railroad companies proposed the establishment of invalids' homes for railroad men who, disabled by age or by accident, had been rendered incapable of earning their living. It was thought fitting to connect these homes with the name of Alexander II., because almost the entire Russian railroad system had grown up under his reign, there being only 650 miles in the empire at the beginning of his reign, which, after 25 years, in February, 1880, had grown to 14,500 miles—and, by the way, has not greatly increased since. The plan proposed was to establish three such homes, one near Moscow, one in the Southwest and one in the West. The means was provided by a contribution of five roubles per verst by all the railroads, which is equivalent to \$5.70 per mile when the rouble is at par, which it never is, the paper rouble worth nominally 75 cents bringing but 50 cents a great part of last year. The money was collected for five years before anything was done, and then there was about \$450,000 on hand. Land was then bought and a beginning made of the first "Home," which was solemnly consecrated Aug. 30, 1886. On that day 31 invalids were received.

The plan provides that married invalids need not be separated from their families, but can bring their wives and young children with them. The bachelors and widowers live together in one large house, while the married men are quartered in smaller houses, each accommodating four families, each of which has its own kitchen and prepares its own food and has its own table, and also its own kitchen garden. Just two years later the Southwestern Home was opened. At this time the site for the Western Home has not been selected.

The total cost of establishing the Moscow Home has been 245,290 roubles, probably something less than \$150,000, and as it shelters 168 invalids, and 126 of their wives and 272 of their children, 564 persons in all, the expense has been but \$266 per person accommodated. To support this home the estimate of expenses for 1891 amounts to 51,833 roubles, not more than \$27,000, of which about \$20,000 is charged for the support of the 168 invalids, or an average of less than \$120 each.

The Southwestern Home has 28 unmarried and 63 married invalids, and the latter have with their 63 wives 109 children, making a total of 263 persons sheltered. The cost of maintenance for the year is 28,546 roubles, of which 18,726 is charged for the support of the 91 invalids, or 206 roubles each, equal to about \$110.

Meanwhile the fund for these homes goes on increasing, and at the end of 1889 amounted to 1,434,758 roubles.

If these figures seem small in comparison with the immensity of the Russian territory, one should bear in mind that two of our states together have almost as much railroad as all Russia. It has about 800,000 soldiers under arms, but only about 22,000 miles of railroad, while we have only 27,000 soldiers and 165,000 miles of railroad. We have just about as many railroad men as Russia has soldiers under arms.

TECHNICAL.

The Vitznau-Rigi Rack Railroad.

In a recent article on the Vitznau Rigi Rack Railroad, Switzerland, in the *Schweizerische Bauzeitung*, it is pointed out that the projectors and builders of this road, the oldest of the European rack railroads, have every reason to review its 20 years' experience with satisfaction.

Although several millions of passengers were carried, not a single accident has been recorded. Even the first trial trips, which were made with two loaded freight cars on May 21, 1870, Ritzgenbach's birthday, showed almost conclusively that much was to be expected of the system and, later results, as is now so well known, fully substantiated the expectations which were entertained. From the date of the opening of the road in the spring of 1870 until the autumn of the same year the original locomotive was employed to transport construction mate-

rials along the line. In the spring of 1871 two new engines were put on the line and the road was opened for regular traffic in the following May. Although no accidents happened even during the first year, many difficulties were encountered in the operation. The requirements of the passenger traffic far exceeded those of the previous transportation of road material. While the public was enthusiastic over the success of the undertaking, the road officials and employees were busily employed, day and night, in making improvements and repairs to keep the line in condition for traffic. The number of passengers from the beginning was so great as to make their accommodation a serious problem, and it was nothing unusual for passengers to be kept waiting for hours before they could be taken to their destination.

The *Schweizerische Bauzeitung* then goes on to describe the locomotives in detail, pointing out the different improvements which have been made in them in the course of time, and giving illustrations of a complete engine and of some of the principal details. The whole forms a very interesting record of the experiences and results arrived at in the management of the road.

Sundry Boilers.

During the past year the Babcock & Wilcox Boiler Company has sold boilers rated at 30,039 horse power in the Pittsburgh district. Of these 15,862 have gone into iron and steel works and 5,500 horse power into glass works. The largest order, 7,000 horse power, was from the Cambria Iron Company, and the next, 3,500, was from the Pittsburgh Plate Glass Company. The last number of *Kuhlows*' states that Berlin now has boilers of 48,050 horse power.

The development of Lake shipbuilding has brought an order for two boilers, each 11 ft. in diameter by 10 ft. 6 in. in length, from Honolulu, Sandwich Islands. The order which goes to the Cleveland Shipbuilding Company is for the steamer "Kinai," sailing under the Sandwich Islands flag, and built by Wm. Cramp & Sons, of Philadelphia, in 1883. The boilers will be taken apart after completion and shipped with the necessary rivets, flues, etc. The Continental Iron Works, of Brooklyn, furnishes the corrugated flues.

First Vessel for the Manchester Ship Canal.

The first vessel specially built for the Manchester Ship canal trade has just been launched at Belfast. She is the pioneer steamer of a direct service which is about to be established between Belfast and Manchester, with Liverpool as a port of call. She is built of steel, and is 180 ft. long, but only 14 ft. deep. Another vessel for the same trade will be ready in a few months.—*Engineering* (London).

Adams Direct Process Iron.

The Adams direct process, which was described in the *Railroad Gazette* of Dec. 19 last, has lately produced a high grade of iron very low in phosphorus, viz., .003, in experiments where all ore was used, the furnace having a carbon bottom and a basic breast. The ore used was Iron Mountain and the iron was made in an open-hearth furnace in about six hours, at the ordinary open-hearth cost of labor with a loss of the metallic iron in the ore not to exceed 15 per cent. as against 12½ per cent. in the ordinary Adams process with ore and pig. Analyses made by Messrs. Hunt & Clapp resulted as follows:

	No. 1.	No. 2.
Carbon.....	.33	.06
Silicon.....	.51	.03
Phosphorus.....	.003	.003

The process is said by the *American Manufacturer* to have removed 90 per cent. of the phosphorus, a result never before attained, the importance of which can hardly be overestimated in cheapening the finer qualities of steel.

THE SCRAP HEAP.

The City & South London Line.

Although there are at present only six trains running on the City & South London line at about six-minute intervals, 23,000 to 24,000 passengers have been carried on one day between the hours of seven in the morning and ten at night, and the published receipts for 14 days, ending Jan. 3, amounted to £1,947; the fare being uniformly two pence. This gives 233,640 passengers carried in 14 days, or at the rate of upward of 6,000,000 per annum. The morning trains from Stockwell to the City are so crowded that the company has found it necessary to close the intermediate stations from about half-past eight to ten o'clock in the morning.—*Engineering* (London).

Sunday Railroad in Switzerland.

In Switzerland a Sunday law has been enacted applying to all railroad, steamboat and tramway companies and postoffices. Working time must not be more than 12 hours a day, even on occasions of increased traffic. Engine and train men must have at least 10 hours unbroken rest, and other employees nine hours. They must also have 52 days off yearly, and 17 of these must be Sundays. No reduction in wages is to be made for such rest days. All freight traffic on Sunday is prohibited, except live stock. The penalty for the first infraction of this law is not less than 500 francs, but a repetition means 1,000 francs, and even the willingness on the part of an employee to work on a rest day does not enter into consideration.

By an Expert on Hogs.

Frenchman (standing up in aisle in American railroad car)—Beg pardon, sare, but haf you evar traveled in France? St. Louis drummer (occupying four seats)—Yes, took a trip through that country last summer. (Admiringly)—Ah! Ze American por-r-k will get zare somehow!—*Chicago Tribune*.

French Scientific Prizes.

The Paris Academy of Sciences has offered, among many others, the following prizes, which relate to subjects of engineering interest, for the year 1891: Prix Francœur: For discoveries or useful works tending to promote the progress of pure and applied mathematics. Prix Poncelet: For the author of any work tending most to further the progress of pure and applied mathematics. Extraordinary prize of 6,000 francs: Any improvements tending to increase the efficiency of the French naval forces. Prix Montyon: Mechanics. Prix Plumey: Improvement of steam engines or any other invention contributing most to the progress of steam navigation. Prix Dalmont: For the engineer who shall present to the Academy the best work on bridges or on highways. Prix Fourneyron: Improvement in the theory of steam engines which take most account of the exchanges of heat between the water and the cylinders and tubes.—*Engineer* (London).



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The prospects of the Western Traffic Association seem quite as good as they were a week ago. (Whether they were good for anything a week ago is a conundrum which we leave to our readers.) The slow progress of the negotiations, so far from being a reason for discouragement, is rather in favor of the chance of permanent success. The deliberations last week were mainly, if not entirely, on the matter of division of territory, and especially the division of passenger business in Colorado and Utah. There is no serious difficulty with the Chicago & Northwestern, which has been generally reported as fighting to keep its Lake Superior ore business out of the arrangement. The most serious present complication now is the settlement of the control of the trans-Missouri passenger business, and there is in sight no good reason why this should not be speedily adjusted.

The Alton consistently maintains the attitude it has held all along. Of course, its position is singularly strong, and it can better afford to stand out than any other road. Naturally it will not hasten to give up its independent position until it is satisfied of the thorough good faith of all of its competitors. But that the Alton is in sympathy with the objects of the association there is no doubt. The prospects of the association have for the past month or two been discussed largely on theoretical lines, so to speak; but the certainty that the freight business of the next few months will be light now puts a practical aspect on affairs, and the agreement will probably, before long, be tested in other features than mere by-laws or division of unimportant territory.

The letter of our correspondent in another column shows in a simple manner, which may be followed by any one, the method by which the increased number of trains which the later Board of Experts has suggested as possible may be switched and moved over the Brooklyn Bridge, when the moderate changes which the Board has recommended shall have been made. Probably the conclusions of the Board as to the increased accommodations which could be thus afforded would have been generally accepted upon the report of the Board, because of the confidence in the judgment of its members felt by all who know them, had not their calculations been impugned by one of our contemporaries, of which the Editor in Chief had submitted to the Board a competitive plan for the bridge termini, and whose opinions would, therefore, have weight as those of an engineer who had studied the questions involved. Yet we are compelled to believe that prejudice has led him to consider them chiefly from the side of his own scheme, or from the interior of his office, being unable or unwilling to adopt any other point of view. For

we may conceive the loop to be the most desirable terminal arrangement, if it can be made practicable, while we admit the justness of the calculations which show that the capacity of the bridge to transport passengers may be doubled without any loop. It will not do for one so accustomed to use graphical demonstrations as is our contemporary to sneer at the diagrams of Mr. Leverich and to call them, as he does, only ingenious-looking. Such diagrams should be met by showing wherein they are wrong, if they are so. In considering the report of the second Board, we are, of course, confronted by that of the first Board of Experts, which differs from it in a manner not to be accounted for, by those unacquainted with the fact that the first Board ignored altogether the teachings to be derived from the experience in operating the bridge which had been acquired by its officers, preferring to attack the questions presented for their investigation from the outside, as problems requiring for their solution only an ordinary acquaintance with transportation matters. The new Board seems to us to have acted wisely in consulting with the only persons who have ever had an opportunity to become acquainted, in a practical way, with the problems peculiar to this bridge only, some of which are of a very grave character. We do, ourselves, hope and believe (as no doubt the members of the recent Board of Experts do, else they would not have recommended experiments to be made with the loop), that some scheme of moving the bridge trains in a cycle, following one another without switching, may be developed, which will be safe and useful; yet we applaud the prudence of the Board which causes it to recommend for adoption only a method which cannot interrupt the present enormous traffic of the bridge. No matter how promising other schemes may appear, the one to be adopted should first be proven, by use in a less critical place, to be suitable for the unprecedented duty which would be required of it at the termini of the Brooklyn Bridge.

A correspondent in another column touches upon some of the points connected with the irrepressible conflict between the traffic and operating departments of railroads in the matter of handling freight cars economically. The facts which he gives concerning outrageous detention of cars of grain, etc., on the road are not different from those with which every one is familiar from long experience, but it is worth noting that such glaring instances of this kind of misuse of cars are still reported in this year, 1891. The partial reform accomplished by the demurrage associations must not be allowed to blind our eyes to the large abuses still existing. The point made by our correspondent concerning the assessment of demurrage on freight belonging to the railroad company is eminently sensible. If unreasonable detention is permitted in this direction, it is unjust to consignees who may need similar cars, besides being costly to the company. If, as is often the case, cars thus detained are borrowed cars, the injustice to their owner is equally deserving of correction. It is true that railroads misuse borrowed cars in many other directions, but this one is specially odious. If the expense of using cars for storage purposes were made to rest upon the departments benefited by the storage, there is no doubt that a considerable minor reform would be accomplished. Many of the delays under this head result largely from thoughtlessness. If the benefit from using a car for storage purposes is of appreciable value, the department to which the benefit accrues should most certainly pay for it. Take, for instance, the case of a new iron bridge occupying a dozen platform cars. In this case the bridge department can often well afford to pay 50 cents or \$1 a day for the cars for a considerable period rather than unload the beams in an inconvenient locality; but no argument is needed to show the injustice of saddling this expense upon the transportation department. When railroads introduce in their own accounts a few reforms of this kind, in the direction of more exact justice, they can with better grace enforce the strict rules which they prescribe for the treatment of ordinary consignees under the same conditions.

The conservatism of the law is well illustrated in a suit before the Supreme Court of Texas, reported in our law column of this week, where a judge virtually decides that it is not necessary, in the interest of safety, that both the conductor and the engineman shall look out for the safety of a train, as, for instance, in the matter of remembering train orders. As every one conversant with train handling knows, this dual responsibility is universally regarded as really a vital element in the maintenance of safety. Whatever lapses from strict compliance with this rule may be permitted occasionally, as in running empty engines

over the road, etc., it is safe to say that very few superintendents would for a moment countenance the idea of abolishing the rule of twofold responsibility. It is true that we hear, every few weeks, of cases of forgetfulness where both conductor and enginemen are guilty of the same dereliction, and it might be hastily argued that the rule throwing responsibility equally upon both of them is of no value; but it must be remembered that the cases where one forgets and the other remembers are never heard of. There may be hundreds of such cases every month, thus justifying the rule; but the conductor who detects his engineman in a dangerous lapse of memory is much more strongly inclined to screen his fellow than to expose him in the interests of good discipline, while the conductor who forgets to stop at a meeting point is most likely checked by the engineman in the ordinary course, and no one outside the crew is ever the wiser. In fact, the conductor doubtless often succeeds in keeping the secret in his own heart. But whatever the practical proof of this rule, its principle is so good that it is sure to be supported by a large majority of railroad superintendents, and the occasional announcement of rules requiring conductors and enginemen to inform brakemen and firemen about their telegraphic orders is an evidence of this. Indeed, this last rule will doubtless be very general whenever superintendents find themselves able to employ men of a higher grade of intelligence in place of those who can just barely read and write.

Wear of Locomotive Tires.

We desire to call attention to the paper on wear of locomotive tires, by Mr. Barr, before the Western Railway Club, given in another column. The paper presents some experimental data on the allied subjects of locomotive counterbalancing and tire wear, which throw light upon points which have hitherto been treated only from a theoretical standpoint. Mr. Barr's conclusions are as follows:

1. Flat places on driving wheel tires are not entirely due to lack of uniformity in the wearing quality of the same.
2. The flat places have a tendency to group themselves where the coefficient of slip is greatest.
3. They vary in depth with the pressure on the rail, and when the pressure does not exceed 11,000 lbs. the imperceptible slip produces but little abrasion.
4. Imperceptible slip does not appear at random on any part of the wheel, but in special localities as fixed by the maximum values of the coefficient of slip.
5. The counterbalance should be as light as possible compared with the reciprocating parts, consistent with smooth riding.
6. The weight of the reciprocating parts should be as light as possible.

Before discussing these conclusions it will be necessary to explain somewhat the diagrams and data presented.

Table 1 gives in the first four columns the pressure of each individual wheel on the rail at different angles of rotation, the zero of measurement being the point of the tire in contact with the rail when the right crank is on the forward lead centre. The column marked "total" gives the total rail pressures of all wheels at the various angles. In the column marked "rotative force at pin" are given actual crank pin pressures reduced to an equivalent at right angles to the crank; these varying crank pin pressures produce varying tractive forces at the rail. In the last column of table 1 are given the quotients obtained by dividing the tractive forces at the rail by the total weights on drivers. This is what is termed in the paper "coefficient of slip" and is, in point of fact, the result obtained by dividing the force tending to slip the wheels on the rails by the total pressure of the wheels on the rails.

Fig. 1 shows the location of the counterbalances and crank pins relative to the flat spots found by experiment. Fig. 2 shows the variation in total pressure of all drivers on the rails during one full revolution; fig. 3 the variation in the actual crank pin pressures reduced to an equivalent pressure at right angles to the crank during the full revolution, and fig. 4 the variation in the ratio of the tractive forces which induce slipping to the total pressure on the rails.

The first conclusion is an important one, as Mr. Barr shows clearly that flat places on driving wheel tires are not entirely due to lack of uniformity in the material of the tires. This he has proved by slipping the tires around on the wheels after the flat places had been turned off. It was then found that the newly-formed flat spots were not in the same part of the tire, but did bear the same relative position to the crank pins and counterbalances. Mr. Barr probably used the expression "not entirely due," because flat spots were found at points where there was no appar-

ent reason for their existence; namely, at 310 degrees for the left front wheel and 210 degrees for the right back wheel. However, it may be, as will be seen in what follows, that a broader statement is true, and that flat places on driving wheels are in general not due to lack of uniformity in the material.

The second conclusion, that the flat places are found where the coefficient of slipping is greatest, is one which will be readily accepted, because if the flat places are the result of slipping, then they will take place where the tendency to slip is greatest, nearly where the coefficient of slip is greatest.

Mr. Barr does not state how the rotative force at the crank pin was obtained; whether from actual or theoretical indicator cards or if the inertia of the reciprocating parts was taken into consideration, and without knowing this it would be impossible to decide if it is true that all of the flat spots cannot be accounted for by the theory advanced. An examination of an inertia diagram of a locomotive engine will show that the resultant crank pin pressures—resultant because both steam pressure and inertia are considered—differ materially from the pressures deduced simply from indicator cards. At considerable speeds it may happen that the resultant crank pin pressures at near the end of the stroke are even greater than at the beginning of the stroke. Hence, by carrying out the investigation to include these resultant crank pin pressures, the flat spots unaccounted for by the theory might have a good reason for their existence. We shall await with considerable interest Mr. Barr's explanation of these features before the club in February.

The third conclusion will probably interest those who are looking for some light upon rail wear. It is stated that when the pressure does not exceed 11,000 lbs. per wheel there is little abrasion. Possibly a long series of observations of the wear of locomotive tires of light and heavy engines might indicate the point in the increase of wheel pressures on rails where both the rails and tires begin to wear rapidly.

The last two conclusions are probably of more practical value than the others, and to the facts given therein we have continually pointed in the past two years as being necessary steps to be taken by locomotive builders if they desire to produce good riding engines without danger of damage to the roadbed. Almost any engine can be counterbalanced to ride well, but this cannot be done without in many cases endangering the track. Light reciprocating parts should receive the most careful consideration of the locomotive designer. The difference between the weights of such parts on engines of equal size running in this country is too great to be within the limits of reason. We can readily point to cases of this sort where one locomotive doing the same work and having the same general dimensions with another has only one-half the total weight of reciprocating parts.

Mr. Barr states that the counterbalances should be as light as possible compared with reciprocating parts, consistent with smooth riding; and we might add that the lighter the reciprocating parts, the smaller may be the proportion of those parts which need to be balanced, because if the reciprocating parts were of extremely small weight they need not be counterbalanced at all.

The points in this paper are extremely valuable, and a discussion thereof by the members of the club will undoubtedly prove to be of great interest.

Some Bad Advice Regarding the Vertical Plane Coupler.

The discussion of the paper on "Air Brakes and Vertical Plane Couplers" before the Western Railway Club, together with an appendix to the paper, are given in another column. There are some points brought out in the discussion which should not be passed by without notice. There was some difference of opinion shown as to the absolute necessity for vertical plane couplers in air-braked trains and the value of spring slack in reducing shocks, but no conclusion contradictory to the statements in the paper was reached. What needs most attention are some statements made by a member who presented a paper treating of vertical plane couplers and air brakes, which are at variance with good common sense. Take, for instance, the statement regarding the immediate necessity for measuring the condition of couplers at points of interchange. It was said:

"Claim is made that there is an urgent need for settling the amount of wear which will be permitted on couplers received in interchange. Where is the need of it at present? . . . It will probably be three or four years before a freight coupler will be worn sufficiently to be dangerous, and there is therefore plenty of time to gain in experience and settle this problem upon a more intelligent basis than would be possible at present.

. . . There is plenty of time to settle this question aright."

The casual reader might take this to indicate that all couplers now in service were in good condition and that there was no need for their examination, whereas the truth is that vertical plane couplers can be found in almost any freight yard that are unfit to run, not only because they are worn badly, but because the knuckle is bent either downward or inward. Not only is it very essential that this subject be taken up and the limit of opening of the knuckle settled, but there is also a need for immediate inspection. It will, of course, be some time before a uniform limit of deviation from the standard lines will be established, say a year at least; but meantime a general understanding should be reached as to what would be considered a defect in a M. C. B. coupler in this respect. The better class of material which is being put into the knuckles at the present time will bend before it will break, and strains which occasionally happen and which ordinarily break a link connection only result in bending the better class of knuckles; and it is these bent knuckles more particularly, rather than the worn ones which need first attention. Delay in this matter of examination would probably result in enough accidents from the breaking in two of trains to prejudice some against the device, and every care should be taken to give it such examination as it needs, and to instruct inspectors in order that they may be as familiar with it and its peculiarities as they now are with the link-and-pin connection. Defective links and pins, whether weak because of wear or cracks, are always rejected when observed, and the careful inspector has an eye to such defects. So also should he know what are the limitations of the usefulness of the vertical plane coupler and be as watchful of it as of the link and pin.

Regarding the strength of malleable iron drawbars, it was said:

"It is not just to credit the present malleable iron bars with a tensile strength of only 80,000 lbs. That figure was all right for a year ago, when many manufacturers had not found out that their bars were weaker than a link, but to-day the case is different."

It is true, then, that there are bars offered for sale which are stronger than those which were put into service a year ago, and that manufacturers have increased the strength of the bars; but the point made in the paper discussed was regarding the bars now in service. This was either missed or evaded by the speaker who made the foregoing criticism. What is now being discussed and written about are the bars which are in service, and which will be the first ones to demand attention.

So also the same speaker said: "Unless steel can be made more uniform and reliable than that at present employed for knuckles, it will hardly prove desirable for bars." The fallacy of this is patent. No doubt there may be many difficulties incident to the introduction of steel for coupler heads, but the fact is that malleable iron for knuckles has proved to be an inferior material, and a better one, namely, steel, has been largely used in its place. Now, if the most difficult detail of the coupler to maintain, namely, the knuckle, is more durable in steel than in malleable iron, why is the same not true of the heads, which are less strained than the knuckles.

With reference to the contour lines, the same speaker said: "The conformity to contour lines is a matter which I believe should be allowed to settle itself so far as possible." This is most dangerous advice, and is in direct opposition to the action taken by the M. C. B. Association last year, when it appointed a committee to limit the variation from the standard contour. The committee at that time had in view a limitation of variation only dependent upon the difficulties incident to manufacture, and had in mind no intention of permitting deviations such as would be considered variations from the contour; but whatever they may report, we may be sure they will not decide that the conformity to the contour lines should be allowed to settle itself.

On the same subject the speaker said:

"Nearly every coupler now made is on the lines, and if a firm with sufficient business sagacity to get a good coupler into extensive use decides that it will vary somewhat from the lines, you may be sure that the subject will be carefully considered by them, and that, at all events, they will soon be out of the field if they put in service a coupler whose lines give trouble. It is their own lookout, and cannot cause railroads much trouble."

This is nonsense. We have practical proof of the difficulties incident to the use of a coupler which was built by a firm of "sufficient business sagacity" to get a large number into extensive use. The result was very bad, and has caused more hard words for the M.

C. B. type than any other reckless construction of the device yet put into considerable use. We are by no means sure that the contour lines will be "carefully considered" by the manufacturer; and who is to pay for the trouble which an imperfect coupler causes before it is discovered to be of bad design? A few badly designed couplers have in two or three instances already cost the railroads more for damages than the whole lot of couplers in use on the road cost originally. It is bad policy to trust to the manufacturer to keep up his product because, in the words of the speaker, "it is their own lookout," and we feel safe in asserting that such a policy is not carried out by any representative railroad in this country. As a rule, railroad companies want to know what they are buying; the condition the material is in, the service it is liable to perform, and the dangers which may be incident to its introduction; and it is safe to say that vertical plane couplers will not be exempt from this policy.

The question of the wear of couplers in freight service will be for some time to come a disputed one. Some considerable light has been thrown upon it by the discussion at the Western Railway Club, and probably more will be added at the next meeting, to which the discussion has been continued.

Import Rates.

The decision of the Interstate Commerce Commission in the complaint of the New York Board of Trade and Transportation against the Pennsylvania Railroad and others is little more than a finding of fact under principles already stated in previous opinions and orders. It serves, nevertheless, to call public attention anew to the questions involved in the making of through rates by railroad and ocean lines in connection. It will be worth while to look at the past history of the whole subject, although in previous cases much more has been said about export than about import rates.

Between no points has there been such active competition as between Chicago and Liverpool. The number of alternative routes is very great. Each route is partly by rail and partly by water. Business can go to Montreal and thence to Liverpool; it can go to Boston by at least two distinct routes, or to New York by half a dozen. It can go to Philadelphia, to Baltimore, or to Newport News, and take steamer from any of these points. The conditions have been such that an effective pool was difficult, if not impossible. As a result rates have often been driven very low; so low that the rate from Liverpool to Chicago was not infrequently less than that from New York to Chicago, a practice which, when carried to this extreme, none would think of defending.

The attention of the Interstate Commerce Commission was called to this through traffic between Chicago and European points at the very outset. In the Boston rate case the Commission, without making a definite decision, showed an inclination to recognize the old practice and to deal with the through route from Chicago to Liverpool as a unit; admitting that, under certain circumstances, the railroads were justified in allowing a low rate on Boston export business as a means of enabling that port to share in the through trade without corresponding reductions for home business destined for Boston. In other words, the Commission treated the through bill of lading from Chicago to Liverpool as it would treat a through domestic bill of lading by a series of connecting lines, making the aggregate rate for the whole shipment the standard, and not trying to divide it into parts which should serve separately as a basis for comparison with the local rates charged on each part of the route.

At the time when the Commission began to take a more radical view of rate regulation in general, it modified its opinion on this subject also. On the 8th of March, 1888, somewhat less than a year after the Boston export decision, the Commission issued a general order that carriers must file their tariffs of rail and ocean rates, and must specify at the same time how much was charged for inland transportation and how much for ocean carriage. "When the rate is a gross sum for the transportation of freight from a point within the United States to a port or place in a foreign country, the tariff as filed and made public shall in every case show what part of the whole is allowed to the carrier or carriers for inland transportation to the point of export by sea, including all terminal expenses or charges; and if such part is subject to be increased or diminished, contingently or otherwise, or if in any other case the charge for inland transportation is subject to any change or modification in case the property carried is exported, the fact, and the manner in which the increase, diminution or change is to be determined, and the extent thereof, shall be stated." Shortly after this complaints were made that the carriers were evading these provisions, charging on goods des-

tinued for New York and points in the neighborhood of New York very much more than they charged as their inland proportion on similar goods destined for Liverpool. The Commission held that these charges were sustained and that the action of the railroads constituted unjust discrimination; but as far as we know comparatively little was actually done on the basis of that finding. A year later, March 8, 1889, the carriers were summoned by the Commission to show what they were doing in these matters, and further orders were made about the close of the same month to compel them to comply with the rulings of the previous year. The Southern railroads made a protest against this last order, showing that its enforcement would probably be disastrous in the case of much of the business which they handled, and in their case the order was suspended on grounds virtually identical with those of the Boston decision of 1887. Practically, therefore, the principle cannot be regarded as well settled. The Commission itself has by its action admitted that the rigid enforcement of its own order might possibly be disastrous, and by implication that the publication of that order was premature.

The present case is simply this: The New York Board of Trade charges that a number of railroads do not obey the provisions of the order. The Interstate Commerce Commission has made a finding of facts sustaining the complaint in the case of some of the railroads involved, and dismissing it in others. What will happen next? The offending roads may claim exemption on grounds similar to those affecting the Southern business or the Boston business, and procure a suspension of the order; or they may go before the courts and claim that the decisions and orders in the case were an inoperative sort of an affair anyway, more honored in the breach than in the observance, and the courts may not impossibly, for the time at least, take the same view; or, as a third alternative, the railroads who have been found to offend may go on doing what they did before and keep it a little more secret, for it is a rather significant fact to people who know how these things are managed that the Commission only sustained the complaint in the case of part of the roads, while others which had pretty certainly done the same things came off scot free; or, finally, if all these things fail, a railroad which was strong enough to purchase a line of steamships or to lease it for a fixed sum could evade the whole trouble without the slightest difficulty, by simply giving too low a proportion of the total charge to the steamship company, and making enough money on the railroad traffic to make up for the loss on the steamships. It would simply be one of those cases where a rigid interpretation of the law drives connecting lines to closer combination.

Anthracite Carriers and Shippers.

The earnings of the anthracite coal carriers during 1890 were on the whole good. The Reading paid the interest on its general mortgage, but nothing on its preference income bonds. The Central of New Jersey paid its regular dividend, as did the Lehigh Valley. The Delaware, Lackawanna & Western also paid its usual 7 per cent. dividend. Yet the condition of the anthracite coal trade is not as favorable as these payments by the carriers would indicate. Out of the total supply about one quarter of the coal is mined by individual operators, that is by operators not controlled by the carriers themselves. The larger part of the output is, however, mined by the carriers themselves, either directly, as in the case of the Delaware, Lackawanna & Western (whose original charter was for a mining and secondarily for a carrying corporation), or else by separate mining companies whose stock is owned by the railroads. The difficulty of the situation arises from the fact that the ownership of the coal lands is thus in many hands. The quarter of the supply mined by private owners can, under the well-known laws of trade, set the price for the whole output. The Lehigh Valley, of all the roads, has the largest number of small shippers along its line. The tons shipped by the Lehigh Valley Coal Co. fell from 1,649,360 in 1888 to 1,464,509 in 1890, while tons from private parties rose from 2,057,369 to 2,499,562. The annual report for 1873 outlined the policy of reserve of the company's lands, this policy being still adhered to.

The individual operators who thus seem to be increasing their output, are, it is alleged, losing money, but cannot stop work. This comes about through the fact that the rates for transportation have remained the same, while the price received at tide water has fallen very low. This tide water price has been on the average about \$3.25 per ton, carrier's charge from mines \$1.75, leaving the price at the mines about \$1.50. During the last year or two a good deal of evidence has been made public about the cost of mining. As a general statement it is fair to put this cost at \$1.50 per ton, including in this labor and work actually paid for in cash. The royalty per ton (which means the value of the land to the owner, who often is not the miner), has steadily risen

till now it is 40 cents per ton, some of the coal carriers paying more through their auxiliary mining companies. There is further to be added the interest on the money paid by the operator for the opening of shafts and other dead (non-paying) work. Altogether we are safe in putting the total cost of coal at the mouth of the mine at \$2 per ton, a loss, at average receipts, of 50 cents per ton. This means a loss to the individual operators and to the auxiliary mining companies alike, the latter, however, being run at a loss, if necessary, so that the tonnage may be carried by the railroad. Some of the railroads will soon be seriously affected in their net earnings by these losses of the mining companies, whose profits form a not unimportant part of the carrier's income. But the individual operators feel the strain first.

The suits brought before the Interstate Commerce Commission by Cox & Brothers, by Haddock, and by Haddock, Shonk & Co. are based principally upon the theory that tolls charged upon hard coal are too high, more than the traffic can bear, and that as the carriers pay the losses of the auxiliary mining companies eventually, these losses should be deducted from the tolls before arriving at a fair basis for charges to outsiders. The whole question is very complex, involving the right of railroads to own or operate mines and also their right to a rate which only pays fair dividends. In his decision denying the Haddock request for a subpoena to compel the Lackawanna road to produce all its private accounts, Judge Cooley proceeds to say in substance that the difference between the selling price at destination and the selling price at the mine may be taken as a criterion of the proper toll. Should this be carried out it would work against the justice of the present charges, for it is said that the instances are very many when a railroad, to keep its own traffic, has bought coal at mines and sold the same at destination at prices whose difference was not half the open tariff charge. In the Haddock case the contracts were put in evidence. Haddock had agreed to ship his coal and pay the Delaware, Lackawanna & Western 50 per cent. of the tide-water price. At \$3.25 this would put Haddock at the mines only \$1.62 per ton. The New York, Ontario & Western, whose Scranton extension is just completed, has made a number of contracts agreeing to accept 40 per cent. of the New York price as freight. The percentage method of computing freight charges is intended to divide profits between miner and carrier, but it only works fairly when tide-water prices are normal, say \$4, or \$4.25 per ton. Cost in each case being unequal, the proportionate gain or loss when prices rise or fall must be unequal.

The railroads properly say that they are not concerned with tide-water prices, and do not make them, being only desirous of charging enough to pay interest and dividends. The root of the whole trouble is the fact that the combined output of coal is greater than the demand, and until this can be regulated either by federation, by enlarged markets (that is by low rates to enable hard coal to compete with soft for manufacturing), or by exhaustion of operators, there can be no permanent peace. It is to be expected that the private shippers, before submitting to the last, would use every legal weapon against the carriers, and might succeed in damaging the railroads greatly. The whole controversy is a serious and far reaching one and the outcome cannot be predicted. The deposit of anthracite is embraced in about 480 square miles of Pennsylvania. The contents of these fields has been approximately measured, and the future foretold. Every ton mined is so much taken from a known and limited supply. It is thought that the year 1925 or thereabouts will see the maximum output, the quantity mined decreasing till 1950 or 1960, when the number of tons which can be dug from the mines may not be enough to supply our needs for domestic use. The failing supply and the increased cost of mining (the coal easily got at being exhausted) may then advance the price greatly. Whether we accept these dates or not, it seems a pity to waste by unnecessary mining a commodity important to human comfort, yet which is likely to be scarce and high, if not practically exhausted, within a hundred years. How to adjust the supply to the demand and the prices and rates to each other in fairness to all concerned, including the public, is the present problem which operators and carriers are pondering.

Possibility of Making Toronto a Seaport.

English papers have a telegram from Toronto reporting a project for deepening the St. Lawrence canals so as to allow a vessel of 25 ft. draught to sail or steam into Lake Ontario, adding that "the Minister of Marine lately said that he hoped soon to see Toronto a seaport, which is interpreted to mean that the Dominion Government considers the project at least feasible."

In 1850 the limiting depth of navigation in the St. Lawrence, below Montreal, was 11 ft.; at the close of 1888 a channel, with a minimum width of 300 ft. where straight, and 325 to 450 ft. wide where curved, and 27½ to 30 ft. deep, had been opened, a work which has involved dredging 15½ million cu. yds. of material since 1875, varying from sand and clay with large boulders to nearly solid rock, at a cost of about \$3,000,000, besides the expenditures in the harbor of Montreal. The navigable depths obtained in the course of this improvement have been as below:

	Feet.		Feet.
1850.....	11	1878.....	22½
1853.....	16	1882.....	25
1859.....	18	1888.....	27½
1865.....	20		

The distance from Montreal to Ogdensburg, at the foot of Lake Ontario, is 119 miles, of which 43½ miles is canal navigation. This is arranged as below, commencing at Montreal with canal:

Name of canal.	Length in miles.	River navigation, miles.
Lachine.....	8.50	15.25
Beauharnois.....	11.25	32.75
Cornwall.....	11.50	5
Farran's Point.....	7.5	10.50
Rapide Plat.....	4.00	4.50
Galops.....	7.62	7.38
	43.62	75.38

The locks on the Lachine canal, like those on the Welland, are 270 × 45, for vessels drawing 14 ft. of water. The locks on all the rest of canals are 200 × 45 with 9 ft. of water as a maximum, and contracts for the enlargement of two or more of the canals above the Lachine to the capacity of that canal have been lately let; so that the determination, if it has been arrived at, to deepen the waterway to 25 ft., which implies widening and lengthening all of the locks as well as deepening them, must have been adopted within a month or two.

This improvement would be of great advantage to the south shore of Lake Ontario, and a very short and comparatively inexpensive canal around the Falls of Niagara would continue it to Lake Erie, giving an outlet not only to the traffic of the upper lakes, but would allow the lake craft access to coasting and other ocean trades during the winter months, but it would not greatly increase the shipments from Atlantic ports of the United States.

The returns made to the British Board of Trade, giving the hours of labor of trainmen in the United Kingdom,* have just been published, and, coming out during the disturbances brought on by the strike in Scotland, have attracted perhaps more than usual attention. The Board of Trade officers make no comment whatever, and the title quoted in our footnote constitutes the whole of the document, aside from the bare tables. The comments of the English technical press are almost equally dry, all the editorials that we have seen being scrappy extracts of the totals and percentages. These are not of sufficient importance to American readers to be given in detail, and, indeed, the English papers are unable to draw any instructive conclusions of consequence from them. The North British Railway, for instance, worked over 70 per cent. of its freight conductors more than 12 hours a day, the Great Northern more than 95 per cent. On the Southwestern all the engineers and firemen exceeded the limit in September and 95 per cent. of them in March. The percentages of men who resumed work after eight hours are divided into those who rested one hour, two hours, three hours, etc. On the South-eastern, in September, 52 per cent. of the engineers and firemen resumed work after resting less than eight hours, but the seriousness of this evil cannot be fairly estimated except by comparing the number of instances in which work was thus resumed, with the total number of trips or days' work performed by the men, and this computation is not made in the report. For instance, the number of men constituting the 52 per cent. just mentioned was 360, and the number of times they rested too little was 850, equal to only 2.3 times per capita during the month. If they worked 27 days in the month this would be less than one trip in 10, and emergencies may have been the occasion of a large share of the cases. The Midland employed 95 per cent. of its engineers and firemen for more than 12 hours continuously, but less than 2 per cent. of them have been set at work with less than eight hours' rest. The 95 per cent., however, consists of 2,556 men who were overworked 35,951 times, equal to more than 10 times per month per man. The London & Southwestern overworked neither the passenger guards, the engineers, firemen, signalmen nor examiners, and only 27 per cent. of its freight conductors. Several of the companies report numerous cases of signalmen working 13 and 14 hours a day, but it is explained that this arrangement is made in compliance with the desire of the men who alternate between day and night work, and prefer to work long hours at night for the sake of having shorter hours when they work in the day time. The figures we have quoted are only specimens copied here and there at random, and must not be taken as intended to "show up" any particular company. Some companies which work their conductors and brakemen long hours are easier on the engineers and firemen, while others which work the latter longer hours are easy with the conductors and brakemen. Considerable local knowledge would be necessary to explain the reasons for these differences.

The Scotch railroad strike has been brought up in Parliament, and there was considerable pressure upon the government for the passage of a law giving the Board of Trade power to compel shorter hours, or an increase in the number of men employed in the train and signaling service of railroads. No definite result seems to have been reached as yet, but the agitation

* Return in pursuance of Section 4 of the Regulation of Railways Act, 1889, of certain classes of weekly paid servants who were, during the months of September, 1889, and March, 1890, on duty on the railways of the United Kingdom for more than 12 hours at a time, or who, after being on duty more than 12 hours, were allowed to resume work with less than eight hours' rest.

seems to have excited a good deal of interest, and it may possibly result in some legislative action. *Industries of Jan. 23*, in a brief note on this strike, assumes to explain the serious nature of the struggle between the roads and their employes by showing that the roads where the difficulty is worst are the poorest managed. It is said that the Glasgow & Southwestern Company's men returned to work some time ago; that those of the Caledonian have partly returned, and that the severest and longest continued struggle was on the North British Railway. It is found that the proportion of rolling stock to mileage of road is largest in the first case, smaller in the second, and smallest in the third; and it is therefore concluded that this insufficiency of facilities, causing a chronic state of discontent both of employes and of the public, constitutes a chief cause of the continuance of the struggle. The report of working hours reviewed in the preceding article tends to confirm this view; though, as above intimated, the facts given in the report are to be used cautiously. The Glasgow & Southwestern worked 90 per cent. of its engineers and firemen more than 12 hours at a time, but the figures indicate that these men did this on an average only eight days in a month. Of the goods guards, 73 per cent. were overworked, but on less than one day per man per month. On the Caledonian 87 per cent. of the engineers were overworked 10 days a month, and 50 per cent. of the goods guards two days. On the North British 70 per cent. of the goods guards worked over hours 13 days in a month, and 70 per cent. of the engineers and firemen 14 days in a month. In the month of September 209 of these engineers and firemen resumed work (after working 12 hours) with a rest of less than eight hours, and they did this on an average nearly three times per man per month.

Cable dispatches since our last issue indicate that the North British strikers have given in, thus putting an end to the strike. It is said that suits for damages were brought against some of the men by the Caledonian Company for "desertion of service." The sheriff, before whom the action was taken, ordered the defendants to pay \$40 each in monthly installments of \$8.

Governor Hill, of New York, has signed the Rapid Transit Bill for New York City and it has become a law. The bill reappoints the commissioners already appointed by the mayor of the city under the former law. These commissioners are: William Steinway, the piano manufacturer; John H. Starin, proprietor of a fleet of river and harbor steamers doing a large freight transfer business; Samuel Spencer, of Drexel, Morgan & Co., formerly President of the Baltimore & Ohio; John H. Inman, President of the Richmond Terminal Railway & Warehouse Co., and Eugene L. Bushe. This board has held several hearings and listened to arguments for the various schemes heretofore mentioned in these columns, as well as others of a less practical nature.

The recent activity of the Manhattan Company in making improvements in its service has been supplemented this week by the announcement that the company had secured control of the Suburban Rapid Transit Railroad, which is an elevated line connecting with the Second Avenue road of the Manhattan company and extending northward into the "annexed district." The Suburban has all along been understood to be controlled by the Gould interest, and the roads have worked together in perfect accord, so that the reported change of control or of management will probably have no marked effect, so far as the public is concerned. No details have yet been given out as to any change of administration. It will be perfectly feasible, of course, at any time to run trains through from the lower end of New York City to the northern terminus of the Suburban road, which is now about 170th street. The connection now in course of construction between the Second Avenue and the Third Avenue lines of the Manhattan road at 129th street will be finished before long and the traffic from the Suburban road will then have access to the Third Avenue line, with its long stretches of third track. Express trains now running on the latter line are scheduled at 34½ minutes from 129th street to the City Hall.

Another interesting item in connection with "rapid transit" is the announcement that the tracks of the Harlem Branch of the New York, New Haven & Hartford are to be connected at their terminus with those of the Suburban road, and that trains will be run through to 129th street, some 50 or 100 rods south of the present stopping place. We understand that the New Haven road has already ordered some light passenger cars, suitable for the elevated structures. This will be a partial accomplishment of one of the plans that was had in view when this branch of the New Haven road was built, which was to provide a passenger line to the lower part of New York City in competition with the old Fourth Avenue line to the Grand Central Station. The traffic of this branch is not yet very heavy, but there is a large excursion business in the summer and the territory tributary to it is susceptible of improvement. Hitherto passengers have had to walk from the Manhattan to the Harlem River station, crossing a bridge and traversing a long flight of steps. A sharp grade will be required in the ascent from the New Haven tracks to the high level bridge of the

Suburban road over the Harlem River, and there is no evidence that heavy trains are to be run over the new connection, but various interesting possibilities are in sight.

The Russian railroad from the Black Sea to the Caspian is entirely isolated from the rest of the railroad system by the mighty chain of the Caucasus. As this line is not far from the Turkish frontier and may be of very great importance in case of war, it has long been desired to establish a connection other than that by sea. Surveys were made as far back as 1874. Water connection may be had from either the Black or the Caspian Sea, but the former may be prevented by a superior naval force, and the latter is circuitous. Until recently it was believed that the railroad connection would be made by building a railroad around the eastern or Caspian end of the Caucasus chain, but surveys have been made during the past summer which, it is said, have determined the government to cross this great mountain chain about midway of its length, from Vladikavkaz, the terminus of a line from northern and western Russia, to Tiflis, on the Black Sea and Caspian railroad, which is known as the "Transcaucasian Railroad." From Vladikavkaz to Tiflis is about 116 miles. This promises to be one of the great mountain railroads of the world. Except for 24 miles on the north side of the divide and 23 miles on the south side, it is said that the grades will not be severe, and that an 8-wheel freight locomotive will be able to take up 34 loaded cars, after which a helper will be required. A chief obstacle to the construction is the nature of the ground on the slopes, which consists largely of masses of loose slate, which have slipped down the mountains, great quantities of which are split off continually by the action of the weather. Again for most of the way there are no roads of any kind. There must be extensive sheds to protect the line from snowdrifts and avalanches, and at the summit a tunnel about 7¼ miles long must be built, the north entrance being 5,180 ft. and the south entrance 4,935 ft. above the level of the sea, the summit of the mountain over the tunnel being about 4,000 ft. higher. For the mountain section of the line there are, however, three alternative routes at different altitudes and each necessitating a tunnel ranging in length from about 2.8 to 9.6 miles. It is thought likely that while the proposed route with a long tunnel section will probably be the most costly one, it will be the favored one, because the tunnel entrances will be below the snow line and thus avoid serious traffic disturbances. The communication over the Caucasus at present is by means of a highway which is itself a marvel of engineering and which passes through an extraordinary Alpine landscape. It is not infrequently completely blocked for weeks by snow.

It is still impossible for any one to speak intelligently of the probable outcome of the Columbian World's Fair. Some of the great causes of anxiety to the promoters are gradually being cleared away, while others are becoming even more serious. Ground was broken last week on the lake front site, although what will be done with the Illinois Central tracks is not yet decided. There has been a great deal of criticism of the "unpatriotic" position of this railroad in holding so tightly to its rights, but we believe that most fair-minded men who have knowledge of the situation agree that the road would be foolish to surrender or even jeopardize one of the most valuable franchises in the world. It may be that the tracks will be moved out toward the lake or sunk, but in any case there will probably be no further delay with the lake front site. Meantime the management seems to be alive to the magnitude of the work before it, and we may reasonably expect that matters will be pushed more steadily from now on. We are assured on the best authority that the promises of exhibits from various countries are most encouraging. Consuls write that several great nations will probably send larger exhibits than were sent to the last Paris Exposition. These improved prospects will give a new impetus to elevated railroad projects, and Chicago is full of inventors, projectors, and promoters. Meanwhile the South Side or Alley road is going on steadily with its construction. The management is not so much disturbed about the finances of the enterprise as recent news dispatches from Chicago would indicate. In fact, there is great confidence felt in its ability to raise all the money necessary for the successful inauguration of the enterprise. The most troublesome problem now apparent seems to be that of transportation. To provide anything like adequate transportation to and from the two parts of the Fair and between them will require a great outlay and a tremendous work, and at present neither the railroads nor the directors of the Fair have even approached agreement upon a comprehensive plan.

Apropos of the discussion in these columns Jan. 2 and 16 concerning the relative safety of white and green as a safety signal at night, a correspondent informs us that one of the fast limited trains between New York and Chicago was unexpectedly stopped one night a few weeks ago at a point where the rear end of the train was apparently protected by a semaphore, the signal being a few hundred feet back of the last car. This being the case, the conductor told the brakeman that he need not go back with his red lantern; but the brakeman happened

to be a cautious fellow and he went back in spite of the conductor's suggestion, and on reaching the other side of the semaphore found that the red glass had been broken and was missing, so that the signal appeared to show all clear. A train very soon came along and the brakeman had some little difficulty in stopping it, and still more in afterwards convincing the engineer that his action in flagging the train was not unwarranted. In the editorial referred to we admitted the comparative remoteness of the danger from using white lights, although we did not admit that it was too small to be noticed or too difficult of removal to make it worth while to attack it; and we do not wish to belittle the point made by Mr. Johnson concerning the immunity from danger in Great Britain under a system which uses hundreds of thousands of white signal lights; but still the arguments offered bring forcibly to mind the case of the culprit in court who brought 500 witnesses to testify that they did not see him commit the crime, but who was nevertheless beaten by one witness who did see him. The practical difficulty in adopting green for all-clear is the lack of a wholly satisfactory substitute for green lights on caution signals. When the possibilities of blue, purple and orange colored glass have been thoroughly exhausted it will be time enough to say that such a substitute is unattainable. People who think that the illuminated semaphore is too expensive or is otherwise unavailable for general use, might also ask themselves whether there is not here a special field for that invention. A vital difference between a change of colors in all-clear signals and the adoption of an automatic device for compelling an engineer's attention, to which our correspondent referred, is that one is a comparatively inexpensive change in an existing appliance, while the other involves a positive addition to the plant, and an addition of a nature which, though excellent in principle, has never been regarded as financially warrantable except on a wealthy road or one doing very heavy traffic.

Senator Cullom, Chairman of the Committee on Interstate Commerce, has this week reported to the Senate the bill heretofore mentioned proposing various amendments to the Interstate Commerce Law. Section 3, prohibiting undue or unreasonable preference, is extended in scope so as to make it apply to "any shipper or consignee of freight over shippers or consignees of like or directly competitive freight by unjust discrimination in the use of cars or vehicles of carriage, or in the payment of mileage or compensation for the use of cars or vehicles of carriage, or in charges for hauling them empty." . . . A clause is also added to the same section, providing that the facilities to be afforded shall include the due and reasonable receiving, forwarding and delivering by every common carrier, at the request of any other common carrier, shipper or consignee, of through traffic at through rates of fares. Section 5 is amended to allow competing common carriers, with the approval of the Commission, to enter into contracts or agreements with respect to traffic. Such agreements, when filed and approved by the Commission, shall be binding between the parties thereto, subject, however, to the authority conferred upon the Commission to annul any such contract or agreement whenever the public interests may require it. This provision is not to be construed to permit the diversion of traffic routed or consigned by a shipper over any specified route. Proper penalties are provided for a failure, neglect or refusal of a party to any such contract or agreement to abide by its terms. An amendment is made to Section 10 so as to prohibit and declare unlawful willful false billing, false classification, etc., or any other device or means for obtaining or for furnishing transportation at less than regular rates. The penalty clauses of Section 10 are strengthened. Other amendments provide that the Commission may require reports from common carriers at any time, and that nothing in the act is to be so construed as to prevent the free carriage of persons injured in railroad accidents, or of physicians or nurses for attendance upon them, or the transportation, free or at reduced rates, of the actual resident members of families of employes.

The Post-Office Department is sending circulars to the railroads containing that section of the law prohibiting the carrying of letters upon trains outside the mail unless properly stamped. The law on this point is rigid excluding, we believe, everything but way bills on the same train with the freight, but the government officials have always ruled that letters on legitimate railroad business could be carried by trainmen without the payment of postage, so that the universal custom has come to be regarded as lawful. One of the sections of the post-office regulations thus permits the carriage of letters pertaining to the business of the road carrying the letter. There are many letters which go over two or more roads each which would, under this clause, be held liable to postage, but it is not clear whether it is this class, or private letters of employes, that the present order is aimed at.

There was a "fluttered dove" in Chicago last week. The Railroad Commissioners of Iowa issued an order revising the new "Western Classification No. 11," and apparently making some serious reductions of rates. There was a turmoil in the Western Freight Association

The daily papers said that rates were reduced 25 per cent.; that the order "confiscated railroad property," and a meeting was called to consider whether or not to resist the order of the Commissioners. For about six hours the righteous indignation of the traffic men boiled. Then it was discovered that the "revision" merely carried over to classification "No. 11" the orders that the board had previously issued from time to time, and under which the roads were already living and working. The right of the Iowa railroads to life, liberty and the pursuit of happiness being again safe, the meeting was called off.

NEW PUBLICATIONS.

Transactions of the Technical Society of the Pacific Coast, August, 1890. Otto Van Celdern, Secretary, 1513 Vallejo street, San Francisco, Cal.

This issue contains a paper entitled "A few facts about Wire Ropeways, with Notes on the Plomosos Mine, with illustrations," by B. McIntire, C. E. After a few general remarks on the subject of wire ropeways Mr. McIntire gives a very minute account of the construction of the ropeway for the Plomosos mine in Sinaloa, Mexico. Then follows a statement of the difficulties met with in the first six years of its operation and of the means employed to overcome them. The article is well illustrated and is valuable.

TECHNICAL.

Manufacturing and Business.

The Canada Electric Railway Signal Co. has been formed at St. John, N. B. to manufacture a patent semaphore and signal which have been recently tested on the Intercolonial, and the Canadian Pacific. George McAvity has been elected President of the company and L. H. Vaughan, Managing Director.

The Canadian Pacific and the "Soo Line" have lately awarded considerable contracts for car heating to the Consolidated Car Heating Co. of Albany, N. Y. The McElroy Commingle and Sewall coupler are specified and equipping is already going on at Minneapolis and Montreal. The Consolidated Car Heating Co. has also lately received orders from the Boston & Maine, the Old Colony, the Fitchburg and the Grand Trunk.

Mr. J. T. Woodward, who has had charge of the Canadian office of the Consolidated Car Heating Co. at Coaticook, P. Q., has become interested in the Norton Improved Compound Jack, and has resigned his position with the Consolidated Company. The agency has been placed in the hands of Messrs. Sleeper & Akhurst, of Coaticook, P. Q., who are large makers of machinery.

It was announced this week that the name of the Dunham Mfg. Co. had been changed to the Q. & C. Company. The car doors, service tie plates and locking spike and other devices controlled by the Dunham Co. will continue to be specialties of the new firm. The "Q. & C." is already a popular trade mark, and we will not warrant them against a suit by the Queen & Crescent route for an infringement of copyright of title. W. L. Findley is President of the new company, Arthur Crandall, Secretary, and C. F. Quincy, Treasurer. The general office is in the Rookery Building, and the New York office is at 120 Broadway.

The Gates Iron Works, 50 South Clinton street, Chicago, has recently shipped eight large rock and ore breakers, which have a capacity equal to 9,000 tons per day to Australia. Four are for the Government of New South Wales, and four for the owner of the Broken Hill Mine. The four breakers ordered by the New South Wales Government will be used for rock ballast for the government railroad lines. The government had one of these breakers in use for over a year before the present order was given. The order was given by cable, and the eight carloads of machinery were delivered at the Sydney docks within 60 days of its receipt at Chicago.

The Johnston Electric Train Signal Co. has removed its headquarters from 620 Atlantic avenue, Boston, to Woburn, Mass., where the factory is situated. Mr. G. S. Russell, of Marlboro, Mass., has been elected Assistant Treasurer of the company.

Private cars have recently been equipped with heating apparatus by the Consolidated Car Heating Co. as follows: The "Oriental," built by the Pullman Company for Austin Corbin, equipped with the coil and disk drum systems; the cylindrical steel car, built at Boston, equipped with single coil heater and commingle; a Lehigh Valley private car, equipped with disk drum and consolidated fire proof heater; Harris palatial car, equipped with fire proof heater and consolidated direct steam system; Canadian Pacific President's car, equipped with commingle system; Wagner car equipped with commingle system and automatic temperature regulator; President's car, Buffalo, Rochester & Pittsburgh, equipped with fire proof heater, commingle and automatic temperature regulator; Vice-President's car, New York, Lake Erie & Western, equipped with the commingle system; President's car, New York, Ontario & Western, equipped with consolidated commingle system, and three New York Central & Hudson River Road pay cars, equipped with commingle system.

The Delaware & Hudson Canal Co. has recently changed its Albany belt line train from direct steam to the commingle storage system, with the temperature regulator. The piping formerly in the cars was used, and the cars are now heated by direct steam or by circulating hot water at will. The regulator has automatically held the temperature of the cars within two degrees of 70 for several weeks past, during which the outside temperature has varied from between zero and 60 degrees.

Iron and Steel.

The Clementsport Iron Co., of Nova Scotia, is applying to the Dominion parliament for an act of incorporation, with power to erect smelting works, etc.

RAILROAD LAW—NOTES OF DECISIONS.

Carriage of Goods and Injuries to Property.

In the Federal Court it is held that under the Texas statute, which stipulates that it shall be the duty of the common carrier to feed and water live stock during the time of conveyance, unless otherwise provided by special contract, the carrier is not liable when it appears that it was agreed that plaintiff should water and feed the

cattle, and the carrier was to stop for the purpose at a particular place, and there is no evidence that the carrier was requested to stop before reaching the place named; and it is held, in the same case, that under section 4,336 of the Federal statute, which provides that no railroad shall confine live stock in cars for more than 28 consecutive hours without unloading them for rest and feeding for at least five consecutive hours, the railroad is not liable.¹

In Alabama the Supreme Court decides that notice to the consignee of the arrival of goods at their destination is not necessary before the reasonable time begins to run after which the carrier's liability as such terminates and its liability as a warehouseman begins, unless the place of destination is a town of 2,000 inhabitants, having a daily mail. Where a piano, which could have been removed from the carrier's depot in about an hour, was shipped over a continuous line of railroad, and the distance from the place of shipment to the destination is such that the property might reasonably have been expected to arrive on the day of the shipment or the next day, and it is allowed to remain three days after its arrival, the carrier will be held liable only as a warehouseman.²

In Arkansas the Supreme Court rules that a statute requiring engine-men to ring a bell or sound a whistle before reaching crossings is for the protection of cattle as well as persons.³

In the Federal Court it is ruled that a locomotive which throws sparks to the height of 50 ft. and to a distance of 100 to 150 ft. is not equipped with a proper spark-arrester.⁴

In Oregon it is held by the Supreme Court that the section of the code declaring that railroad companies shall be liable in damages to the owners of all stock killed on the unfenced tracks of such companies do not apply to unfenced depot grounds.⁵

In Iowa the Supreme Court rules that where a ticket is sold by a railroad company for a continuous passage over its own line, and thence over the lines of other companies, to the destination, the initial company may, by a stipulation in the contract of carriage, limit its liability for injury to baggage to such injury as may occur on its own line.⁶

In New York a mill owner granted right of way to a railroad on condition that it would not fence opposite the mill, which stood 5 ft. from the boundary line. The road leading by the mill platform was partly on the mill land, and partly on the right of way. Plaintiff's team escaped from in front of the mill, and, running upon the tracks, was killed. The Court of Appeals holds that the railroad was not liable for failure to maintain a fence at this point under a statute providing: "But no railroad corporation shall be required to fence the sides of its roads except when such fence is necessary to prevent horses, etc., from getting on to the track of the railroad from the land adjoining the same."⁷

Injuries to Passengers, Employees and Strangers.

In Texas the Supreme Court rules that though it is customary with other roads to send out water trains with a conductor, negligence of the company in not putting a conductor in charge will not authorize a verdict for the killing of the fireman in a collision occasioned by failure of the engineer to obey orders to await a passenger train at a certain station.⁸

In Missouri, in an action for the death of a brakeman, it was shown that deceased was engaged at night in switching cars on a track where there was a rail so worn as to be 1½ in. lower than the next one at the joint, so that a car passing over the joint would be jarred, and that deceased fell from the car on which he was riding, striking the ground at a point consistent with the theory that he was thrown off by the jar in passing over the joint, and that he was dragged some distance and killed, though nobody saw the accident. The Supreme Court holds the railroad liable.⁹

In Georgia the Supreme Court rules that for an employee to get on an engine which is running at from 6 to 12 miles an hour is negligence on his part, which is not excused by the fact that a superior or a "boss" ordered him to do so.¹⁰

In Minnesota the Supreme Court holds that a section-man who has worked more than three months on the track of a railroad, where about one-third of the trains passing over the same were extra trains, not running on schedule time, is chargeable with notice of the practice to run such trains, and assumes the risk incident thereto.¹¹

In Alabama the Supreme Court holds that in a suit by a city fireman against a railroad for personal injuries received in consequence of the overturning of a hose cart on which he was riding, alleged to have been caused by coming in contact with an improperly placed rail, the negligence of the driver of the hose cart could not be imputed as contributory negligence to plaintiff, when it appeared that he had no authority or control over the driver.¹²

¹ Mo. Pac. R. Co. v. Tex. & Pac. R. Co., 41 Fed. Rep., 819.

² Columbus & W. Ry. Co. v. Ludden, 7 South. Rep., 471.

³ St. L. & S. R. Co. v. Hendricks, 13 S. W. Rep., 699.

⁴ Mo. Pac. v. Tex. & Pac., 41 Fed. Rep., 917.

⁵ Elise v. N. P. R. Co. (Or.), 23 Pac. Rep., 898.

⁶ Peterson v. C. R. I. & P., 45 N. W. Rep., 573.

⁷ Doan v. N. D. & C. R. Co., 24 N. E. Rep., 824.

⁸ Gulf, C. & S. F. Ry. Co. v. Compton, 13 S. W. Rep., 667.

⁹ Soeder v. St. L. & S. R. Co., 13 S. W. Rep., 714.

¹⁰ Roul v. C. T. V. & O. R. Co., 11 S. E. Rep., 588.

¹¹ Larson v. St. P. M. & M. Ry. Co., 45 N. W. Rep., 722.

¹² Elyton Land Co. v. Minge, 7 South. Rep., 696.

LOCOMOTIVE BUILDING.

The Lake Shore & Michigan Southern has let a contract for 25 engines to the Brooks Locomotive Works.

The Cleveland & Canton is having seven engines built by the Brooks Locomotive Works.

The following railroads are also said to be in the market for new locomotives, and the specifications of some of them are already out: Northern Pacific, Chicago & Eastern Illinois, Wisconsin Central and East Tennessee, Virginia & Georgia.

The Rhode Island Locomotive Works have delivered several four-wheeled switching engines to the Boston & Albany, and there will probably be delivered this week to the New York & New England a 10-wheeled locomotive with 18 x 24 in. cylinders and 54 in. wheels, and weighing 103,000 lbs. Two locomotives for the Mexican Northern were also completed last week. The cylinders are 19 x 24 in. and the driving wheels 56 in. The engines have the American steam driver brake.

The Rhode Island Locomotive Works has completed a compound locomotive with 73-in. driving wheels for the New York, Providence & Boston. The cylinders are 18 x 24 and 28 x 24. We learn that the engine is doing very well in freight service, and hope to have further information soon.

The Rio Grande Western has increased its recent order for locomotives to 25 engines.

The Baldwin Locomotive Works have orders for 30 engines for the Manhattan (elevated) and for 13 locomotives for export to South America for the Central of Brazil.

The Seaboard & Roanoke is building a number of locomotives at its Norfolk shops for the Georgia, Carolina & Northern.

CAR BUILDING.

The Chicago, Burlington & Quincy has placed an order for 200 cars with the Peninsular Car Co., Duluth, Minn.

The Missouri Car & Foundry Co. is building 600 freight cars for the Missouri, Kansas & Texas. The company is also building 500 of Street's stable cars.

The Northern Pacific will soon let contracts for 1,000 cars, and contemplates within a short time to increase the number by 2,500.

The Chicago & West Michigan will add 10 passenger cars to its equipment at a cost of about \$4,500.

The Wason Car Mfg. Co., Brightwood, Mass., has orders for 101 passenger cars to be delivered during the next five months to the following railroads: 22 to the Old Colony, 50 to the Manhattan (elevated), 20 to the New York, New Haven & Hartford and nine to the Los Angeles Terminal.

The Boston & Maine has received five new Pullman vestibule cars for its express trains.

The United States Rolling Stock Co. has finished 25 freight cars at its Anniston shops for the Queen & Crescent lines.

The Hogan Refrigerator Car Co., Chicago, has been incorporated for the manufacture of refrigerator cars. The incorporators are E. J. Johnson, A. Woodward and H. P. Pearson.

The Rio Grande Western has increased its recent order for cars to 75 fruit and 25 box cars and 12 passenger cars.

The Columbia Car Co. has begun constructing shops in Chicago, on a lot of 570 acres which it owns. The length of the shops is to be 600 ft. The dimensions of the new buildings will be: Paint shop, 200 x 72 ft.; two erection shops, 200 x 72 ft.; road shop, 140 x 48 ft.; machine shop, 100 x 48 ft., and blacksmith shop, 80 x 72 ft. The tracks of the Chicago & Northwestern and the Wisconsin Central will reach the new shops.

BRIDGE BUILDING.

Aspinwall, Pa.—The Aspinwall Bridge Co. has been organized to erect a bridge between Aspinwall and Allegheny. B. L. Wood, Jr., is President.

Boston, Mass.—A hearing was given last week before the committee on cities upon the petition of the city for authority to borrow, outside the debt limit, \$300,000 for the construction of a new bridge across the channel between L and Congress streets.

Cedar Rapids, Ia.—The Railroad Commissioners have approved plans for an 80-ft. viaduct over the railroad tracks at Cedar Rapids.

Dublin, Ga.—Work on the two bridges now being constructed across the Oconee River at this point is progressing rapidly. The railroad bridge will be a steel structure, resting on brick piers, and will cost, including the piling through the swamp, \$30,000. The county bridge will be iron, with concrete piers, eased with iron sheeting one-fourth of an inch thick, and will cost about \$16,000 when completed.

Fort Worth, Tex.—The City Council has decided to build a new bridge on the north side of the city, the structure erected a year ago being condemned on account of the shifting of the river banks, which has endangered the piers.

Girard, Ala.—Work has commenced on the erection of the new iron bridge for the Mobile & Girard Railroad across the Chattahoochee River. This bridge will replace the present one, which is of wood. It will be built on the same piers, and the wooden one removed by sections, so as not to obstruct the passage of trains.

Houghton, Mich.—A bill has been introduced in the Senate permitting the construction of a bridge across Portage Lake between Houghton and Hancock. The state legislature in 1887 authorized the submission of the construction of such a bridge to the people of Houghton County. It is necessary to obtain government permission to erect a bridge over the lake.

Houston, Tex.—Bids will be received up to Feb. 12 for building iron or combination bridges and approaches across Bray's and Sims' Bayous on the Houston & Lynchburg road, bidders to furnish plans and specifications. Separate figures will be required on each bridge. All bids to be addressed to C. F. Winkler, County Clerk of Harris County.

Jamestown, N. Y.—The New York, Lake Erie & Western is having plans made for a new, double track iron bridge, which will take the place of the trestle across the Chautauque Lake outlet at Jamestown. It is likely the new structure will be in place next summer.

Montreal, Que.—The Royal Bridge & Iron Co., of Montreal, is applying to the Dominion Parliament for a charter for the manufacture and construction of iron, steel and other bridges. The amount of the capital stock of the company will be \$30,000.

Pencoyd, Pa.—A. & P. Roberts & Co., of Pencoyd, are having plans prepared for an iron foot bridge, which will be erected in the spring, to cross the Schuylkill River from a point near the central part of their works.

Port Arthur, Ont.—The first of a series of lattice-deck steel-girder bridges which are to be erected on the Port Arthur section of the Canadian Pacific's western division was placed in position over Eagle River last week. The old truss bridge was removed and the new one put in within five and a half hours. The new bridge, which is 78 ft. long, was suspended by tackle and lowered into position after the old structure had been cut from beneath and allowed to fall into the gully.

Scranton, Pa.—The Common Council has passed a resolution providing for plans for a bridge at Market street.

Various Projects.—The House has passed the Senate Bill authorizing the Norfolk & Western to bridge the Tug Fork of the Big Sandy River; also, the Senate bill to authorize the construction of a bridge across the Cumberland River by the Chesapeake & Nashville.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Chicago & Alton, quarterly, \$2 per share, on the common and preferred stock, payable March 2.
Print & Pere Marquette, semi-annual, 2 per cent., payable Feb. 16.
New York, Providence & Boston, quarterly, 2½ per cent., payable Feb. 10.
St. Paul & Duluth, 2½ per cent. on the preferred stock, payable March 2.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Allegheny & Kinzua, annual, Olean, N. Y., Feb. 10.
Camden & Atlantic, annual, Cooper Point, Camden, N. J., Feb. 25.
Chicago & Bell, special, Chicago, Ill., Feb. 24, for the purpose of making a new lease with the Chicago & Western Indiana.
Chicago & Western Indiana, special, Chicago, Ill., Feb. 24, to consider proposed improvements.
Chippewa Valley, annual, Mount Pleasant, Mich., Feb. 18.
Cleveland & Canton, special, Canton, O., Feb. 25.
Delaware, Lackawanna & Western, annual, 26 Exchange Place, New York City, Feb. 24.
Grand Rapids & Indiana, annual, Grand Rapids, Mich., March 4.
Kingston & Pembroke, annual, Kingston, Ont., Feb. 11.
Missouri Pacific, annual, St. Louis, Mo., March 10.
New York, Susquehanna & Western, annual, Taylor's Hotel, Jersey City, N. J., Feb. 26.
Norfolk & Virginia Beach, special, Norfolk, Va., March 2.
Northern Central, annual, Baltimore, Md., Feb. 26.
Philadelphia & Erie, annual, Philadelphia, Pa., Feb. 9.
Scioto Valley & New England, annual, Columbus, O., Feb. 12.
St. Louis, Iron Mountain & Southern, annual, St. Louis, Mo., March 10.
Summit Branch, annual, 233 South Fourth street, Philadelphia, Pa., Feb. 10.
Toledo & Ohio Central, special, Toledo, O., Feb. 18, to consider a proposed increase of the capital stock.
Western Counties, annual, Yarmouth, N. S., Feb. 11.

Railroad and Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, in the Gilsey House, New York City, at 2 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station at 7:30 p. m.

The *Northwestern Truck and Bridge Association* meets on the Friday following the second Wednesday of each month at 7:30 p. m. in the directors' room of the St. Paul Union station, except in the months of July and August.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturday of each month, excepting in January, when the annual meeting is held on the second Saturday of the month. The second January meeting is held on the third Saturday. The club stands adjourned during the months of July, August and September.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 3:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8:00 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8:00 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month, at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

Engineers' Club of Cincinnati.

The regular meeting of the club was held on the 15th inst., 35 members and several visitors being present. Louis Zepernich and John W. Cowper were elected members. The committee appointed to investigate the advisability of the club becoming a member of the Association of Engineering Societies presented its report, and after some discussion of the subject it was decided that the club defer the matter for the present. Mr. Edwin A. Hill, Real Estate Agent of the Cleveland, Cincinnati, Chicago & St. Louis, read a paper on "Office Records," which comprised a very thorough and comprehensive description of the manner of filing the correspondence, deeds, leases, agreements, etc., and conducting the accounts and correspondence of his department.

Illinois Society of Engineers.

The sixth annual meeting of the Illinois Society of Engineers and Surveyors, was held at Springfield, Jan. 29-30, 1891. The programme consisted of twelve papers, the discussion of thirteen topics, and reports from five standing committees. Most of the subjects treated were of special interest to surveyors, and drainage, mining and municipal engineers. The papers of special interest to our readers were: "Office Records," by E. A. Hill, Cincinnati, Ohio, real estate agent of the Cleveland, Cincinnati, Chicago & St. Louis, which gave a description of the method of handling the business of his office; and "Safety Appliances in Railroad Travel," by Charles Hansel, consulting engineer to the Illinois Railroad Commission, which consisted of a résumé of progress in this line. The annual address of the President, Prof. A. N. Talbot, on "Some Qualifications of the Engineer" was excellent. The society recommended the appointment of an additional state mine inspector, and also recommended the addition of an engineering staff to the state railroad commission. The society also took steps to secure the appointment of a state commission to report upon a revision of the road laws, and the best method of improving the highways of the state. Prof. A. N. Talbot, of Champaign, was re-elected President, and S. A. Bullard, of Springfield, Executive Secretary and Treasurer. The place of the next annual meeting was referred to the society to be decided by letter ballot, the places to be voted for being Chicago, Champaign, Lincoln and Alton.

New England Railroad Club.

The regular meeting of the club will be held at the United States Hotel, Boston, Feb. 11, at 7:30 p. m. The subject for discussion is: "Varnishing and Painting of Railway Rolling Stock." The subject will be introduced by Charles Richardson. The Master Painters of New England Railroads and officers of the Master Car and Locomotive Painters' Association of the United States and Canada are specially invited to attend.

Technical Society of the Pacific Coast.

At a meeting of the society at its rooms in San Francisco, Jan. 23, the following officers were elected for the year 1891: President, John Richards; Vice-President, Luther Wagoner; Treasurer, Geo. F. Schild; Secretary, Otto Von Geldern; Directors, Hermann Kover, Ross E. Browne, C. E. Grunsky, James W. Reid, and Alpheus Bull.

PERSONAL.

—Mr. S. S. Neff, Superintendent of the Cornwall road, has resigned to accept a position on the Great Northern.

—Mr. E. A. Smith, Assistant Secretary for the Consolidated Car-Heating Co., has been appointed Purchasing Agent.

—Mr. H. R. Thomas, of Sumter, S. C., has been appointed Railroad Commissioner by the Governor to succeed the late ex-Governor Borham.

—General Levi W. Lawler and Mr. W. C. Tunstall, Railroad Commissioners of Alabama, whose terms expire next March, have been nominated by the Governor to succeed themselves, and the State Senate has unanimously confirmed the nominations.

—Mr. S. H. Harrington, Mechanical Engineer of the Cleveland, Cincinnati, Chicago & St. Louis, has resigned, and will devote his attention to the interest of his various inventions. The position of mechanical engineer on this road is to be abolished.

—Mr. Hiram Fowler, a civil engineer well known in New England, died at his home in Westfield, Mass., Feb. 3, at the age of 60. He had charge of the construction of the Connecticut Valley road, now the Hartford & Connecticut Valley Division of the New York, New Haven & Hartford, and afterward became superintendent of it.

—Mr. George L. Sands, General Superintendent of the lines of the Atchison, Topeka & Santa Fe west of the Missouri River, has resigned, and will be succeeded by Mr. H. R. Nickerson, General Superintendent of the lines east of the Missouri River. Mr. Nickerson was recently appointed General Superintendent, having been formerly Superintendent of the Middle Division.

—Mr. C. S. McCargo, General Freight Agent of the Allegheny Valley road, died in Allegheny, Pa., last week of typhoid fever, from which he had been suffering for two weeks. Mr. McCargo was 28 years old and had been in railroad service for 12 years. He had already shown unusual ability, and his death closes a very promising career. He was a nephew of the General Superintendent of the Allegheny Valley.

—Mr. V. G. Bogue, for many years Chief Engineer of the Union Pacific, has resigned that position, but will continue to have charge of the construction of the Portland - Puget Sound road. Mr. E. C. Smeed, who has been Assistant Engineer, has been appointed Chief Engineer. Mr. J. S. Cameron, Chief of Construction, has also resigned. Mr. Cameron was formerly connected with the Chicago, Burlington & Quincy, but resigned when Mr. T. J. Potter became Vice-President of the Union Pacific.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—George L. Sands has resigned the position of General Superintendent of the lines west of the Missouri River. H. R. Nickerson has been appointed General Superintendent of the lines both east and west of the Missouri River, with headquarters at Topeka. A. P. Tanner, now Assistant General Freight Agent, will be Superintendent of the lines east of the Missouri, with office at Chicago.

Atlantic & Danville.—Charles H. Cromwell and Alfred P. Thorn are the Receivers of this company.

Boston & New York Shore Line.—F. A. Shutes has been appointed Superintendent of the Boston & New York Shore line (through passenger car line), with headquarters at Grand Central Station, New York.

Chicago & Erie.—R. F. Kredell, has been appointed Master Mechanic, with office at Huntington, Ind., vice W. F. Turrell, promoted.

Cleveland, Cincinnati, Chicago & St. Louis.—E. F. Cort, Superintendent of Construction for the Armour Packing Co. of Kansas City, Mo., has resigned to accept the office of Assistant General Freight Agent of this road, with headquarters at Chicago.

A. D. McLeod has been appointed General Agent of the freight department at Sandusky, O. The jurisdiction of Ford Woods, Assistant General Freight Agent of the Indianapolis division at Indianapolis, Ind., has been extended over the Sandusky division.

Colorado & Northwestern.—The directors of this new Colorado company are: W. L. Graham, M. D. Thatcher, O. H. P. Bexter, H. R. Holbrook, J. B. Orman, E. M. Steek, H. J. Fitch, of Pueblo, Col., and George Swink and J. E. Godding, of Rocky Ford, Col.

Corpus Christi & South America.—George Vineyard has been appointed General Passenger and Ticket Agent, with headquarters at Corpus Christi, Tex.

Cumberland Valley.—The following directors were elected at the annual meeting in Martinsburg, W. Va., Jan. 27: Holmes Conrad, G. Smith, Dr. R. W. Stone, Winchester, Va.; M. C. Kennedy, J. Stewart, Gen. J. F. Boyd, Channey Ives, Chambersburg, Pa.; G. M. Bowers, A. J. Thomas, W. T. Stewart and Hon. E. Boyd Faulkner, Martinsburg, W. Va. The Directors elected, President, T. B. Kennedy, Chambersburg; Secretary, M. T. Ingles, Martinsburg; Treasurer, James B. Russell, Winchester, Va.

De Kalb, Aurora & Eastern.—The incorporators of the company are: Jacob Haish, H. D. Wyman, J. L. Ellwood, P. G. Young, J. F. Glidden, Thomas Corkings, W. L. Ellwood, J. H. Lewis, Clinton Rosette, E. C. Lott and A. W. Fisk, all of De Kalb, Ill.

Florida Midland & Georgia.—At the annual meeting of the Georgia & Florida Construction Co., at Valdosta, Ga., the following Directors were chosen: W. S. Jordan, J. W. West, Madison, Fla.; J. R. Young, J. B. Withers, Savannah; J. M. Wilkinson, T. G. Cranford, J. F. Lewis, E. L. Moore and N. A. Williams, Valdosta. The Board elected the following officers: J. M. Wilkinson, President; J. B. Withers, Vice-President; W. S. West, Secretary and Treasurer.

Georgia.—Elwood S. Scheetz has been appointed Master Car-Builder, with office at Augusta, Ga., vice T. M. Preval assigned to other duty.

Grand Trunk.—Charles Stiff, Superintendent of the Western Division, has been transferred to London, Ont. R. Larmour, Assistant Superintendent, succeeds him as Superintendent of the Western Division.

Granite.—The following officers and directors of this New Hampshire company were elected at the last annual meeting: President, W. B. Sewall; Vice-President, J. W. Leighton; Directors, J. F. Osgood, W. B. Williams, G. F. Green, F. S. Davis; Clerk and Treasurer, J. A. Simpson.

Gulf, Colorado & Santa Fe.—T. M. Bisbee has been appointed General Roadmaster of the Northern division in charge of the maintenance of way, bridges, buildings and water service departments, with headquarters at Cleburne, Tex.

Hartsville, Fordville & Western.—The officers of this Kentucky road are: President, T. J. Smith; Vice-President, J. T. Miller, and Secretary and Treasurer, John J. McHenry, all of Hartsville, Ky.

Huntingdon & Broad Top Mountain.—The following directors were elected at the annual meeting in Philadelphia, Feb. 2: President, Spencer M. Janney; James Long, James Whitaker, Thomas R. Patton, Jacob Naylor, Johns Hopkins, Samuel Bancroft, Jr., Robert H. Crozer, William J. Barr, M. E. McDowell, John B. Wattson, William Bault and George H. Colket.

International & Great Northern.—Thomas Campbell, of Longview, Tex., has been appointed one of the Receivers of the road, to fill the vacancy caused by the death of J. M. Eddy.

Jersey City, Newark & Western.—The officers of this company are: John Hood, President, No. 228 South Third street, Philadelphia, Pa.; D. G. Baird, Secretary, No. 228 South Third street, Philadelphia, Pa., and Walter G. Berg, Chief Engineer, Jersey City, N. J.

Joliet, Lishon & Western.—The following is a corrected list of the incorporators of this Illinois road: W. S. Weese, J. C. Shaw, Lewis Christian, Edward Litzy, of Plattsville, Ill.; Levi Platt, E. S. Holland, N. S. Nelson, I. L. Kelsy, E. S. Fletcher, Joseph Marwick, Peter Morrison, John Moore, Daniel Hill, Austin Osmon, of Lishon, Ill.; W. H. Shufeldt, of Whitewillows, Ill.; F. L. Stephens, of Newark, Ill.

Lehigh Valley.—Alonzo P. Blakslee has been appointed Assistant Superintendent of the general Eastern coal branches, including Mahanoy, Beaver Meadows and Hazleton divisions, with headquarters at Mauch Chunk, Pa.

Little Miami.—The stockholders of the company elected the following directors at the annual meeting, for terms of three years each: James N. Gamble, of Cincinnati, succeeding A. D. Bullock, deceased; and T. D. Messler, Pittsburgh, A. S. Fraser, of Xenia, O., and William Worthington, of Cincinnati, succeeding themselves.

Louisville & Nashville.—Brent Arnold has been appointed Superintendent of Terminals with office at Cincinnati, O. He will have charge of the Transportation Department of this company and the Kentucky Central from Cincinnati, O., to Milldale, Ky., inclusive.

Marietta & North Georgia.—J. B. Glover, who has been acting as temporary receiver of the road, has been made permanent receiver by the United States Court at Atlanta, Ga.

Middle Georgia & Atlantic.—The following are the directors of the construction company, the Seaboard company: M. Brown, of Barnwell, S. C., President; William Garrard, Savannah, Vice-President, and E. Kanrow, I. G. Haas, G. O. Granger, of Philadelphia; E. C. Machen, J. P. Williams, W. C. Clark, Covington, Ga., and A. O. Granger, Philadelphia, Pa.

Middletown & Cincinnati.—The officers are: P. J. Sorg, President; T. C. Simpson, Secretary and General Manager, Middletown, O., and M. D. Burke, Chief Engineer, 41 Pike's Building, Cincinnati, O.

Newark, Somerset & Straightville.—The annual meeting of the stockholders, held at Newark, O., last week, resulted in the election of the following as directors: Orland Smith, Cincinnati; R. T. Devereis, Bellaire; David Lee, Zanesville; J. H. Collins, Columbus, O.; Washington Cowen, John Reed, Mansfield, O.; A. W. Dennis, Newark, and Captain W. W. Peabody, Madisonville.

New London Northern.—The annual meeting of the stockholders of the company was held in New London, Conn., Feb. 4. The old board of directors was re-elected. Robert Coit was re-elected President and Treasurer, and J. A. Southard, Secretary.

New York Central & Hudson River.—John B. Campbell has been appointed Assistant Superintendent of Motive Power of this company.

New York & New Jersey Terminal.—The trustees of the company recently organized in New York are: Thomas Sturgis, Wm. C. Lane, George H. Taylor, A. R. Herri-man, Wm. C. Cox, Thomas S. Smillie, Isaac P. Martin, Isaac D. Fletcher and Thomas Rutter, all of New York City; Charles P. Mackie, of Englewood, N. J., and Wm. Marshall, W. S. Jarvis and Henry W. Slocum, of Brooklyn.

New York & Suburban.—The directors are: David M. Talmadge, William Caldwell, Edwin H. Myers, David E. Austin, Alexander Robert Chisolm, James F. Cox, David Provost, New York; Crowell Hadden, A. W. Dexter, Andrew J. Willets, William H. Duryea, Brooklyn; John F. Anderson, William L. Watson, Whitestone.

New York, Texas & Mexican.—At the annual meeting of the stockholders at Victoria, Tex., Jan. 30, the following board of directors was elected: H. P. Huntington, J. Kruttschnitt, C. C. Gibbs, W. G. Van Vleck, A. Dacosta and M. D. Monserrate.

Norfolk, Albemarle & Atlantic.—The directors of this company, the re-organized Norfolk & Virginia Beach, have elected these directors: J. B. Harrison, J. G. Friend, N. W. Berkeley, J. M. Dickie and B. P. Holland. N. W. Berkeley, Danville, Va., is President, and George M. Glacier, Norfolk, Va., is Secretary.

Peterboro, Bobcaygeon & Sault Ste. Marie.—At a meeting of the promoters of this road the following officers were elected: President, John Burnham; Vice-President, Thomas Cahill; Treasurer, R. A. Morrow; Secretary, E. H. Hall. Provisional Directors, James Stevenson, J. R. Stratton, John Burnham, T. Cahill, R. G. Morrow, W. H. Moore, R. S. Davidson and E. H. D. Hall.

Pittsburgh, Cincinnati & St. Louis.—W. C. App, of Logansport, Ind., has been appointed Master Mechanic of the shops at Dennison, O. This appointment is made to fill the vacancy caused by the death of C. B. Street, last November. S. S. Stiffey, General Foreman of the Dennison shops, has been appointed Master Mechanic at Logansport.

Pittsburgh & Lake Erie.—At the annual meeting held in Pittsburgh last week these directors were elected: John Newell, President; Cornelius Vanderbilt, W. K. Vanderbilt, F. W. Vanderbilt, Hamilton McK. Twombly, E. D. Worcester, M. W. Watson, Henry Hice, James I. Bennett, James M. Bailey, J. H. Reed, J. M. Schoon-maker and D. Leet Wilson.

Pittsburgh, McKeesport & Younghiogheny.—The stockholders elected the following directors at the annual meeting: J. H. Reed, President; Cornelius Vanderbilt, W. K. Vanderbilt, Hamilton McK. Twombly, James Tillinghast, John Newell, James M. Bailey, James I. Bennett, M. W. Watson and Henry Hice.

Providence & Worcester.—At the annual meeting in Providence, R. I., Feb. 2, Moses B. I. Goddard, Oscar J. Rathbun, Joseph E. E. Davis, Jonas E. Clark, George S. Barton, John W. Danielson and G. Marston Whitin were chosen directors.

Richmond & Danville.—Peyton Randolph has been elected Third Vice-President of this company, with office at Washington, D. C. He will represent the Executive Department in the direction of the Accounting and Treasury Departments, and in a general supervision of other departments. W. H. Green has been elected General Manager of this company, with office at Washington, D. C., vice Peyton Randolph, elected Third Vice-President. He is charged with the direction of the operation of the Transportation Department in all its branches, and will report to the First Vice-President. The office of General Superintendent and Assistant General Manager has been abolished.

W. B. Ryder, Superintendent of the Richmond division, has been transferred to the position of Superintendent of the Georgia Pacific division. Edmund Berkeley, Superintendent of the Atlanta & Charlotte division, has been transferred to the Richmond division, and C. P. Hammond, now Superintendent of the Georgia Pacific division, will be transferred to the Atlantic & Charlotte division.

Ridgway & Clearfield.—The company held its annual election in Philadelphia this week and the following officers were elected: President, J. N. Du Barry; Directors, W. H. Barnes, John P. Green, Wistar Morris, G. B. Roberts, N. Parker Shortridge and Henry D. Welsh.

St. Louis & Northern.—The incorporators are Isaac L. Morrison, David W. Rider, W. W. Kent, Wm. S. Hook and Marcus Hook, Jacksonville, Ill.

San Francisco & Mateo.—The incorporators of this company have elected the following officers: Behrend Joost, President; W. F. Thomas, Vice-President; J. H. Gilmore, Treasurer; J. W. Hartzel, Secretary and General Manager. The principal office is in San Francisco.

Sioux City & Northern.—A. K. Shurtleff having resigned the position of Chief Engineer of this company, L. F. Wakefield has been appointed Chief Engineer to fill the vacancy.

Syracuse & Baldwinsville.—The following officers have been chosen by the directors: Charles D. Marvin, President; W. C. Andrews, Vice-President; F. M. Patchen, Secretary; F. F. Bentley, Treasurer.

Tennessee & Coosa.—The stockholders held their annual meeting at Huntsville, Ala., last week and elected the following directors: J. W. Thomas, J. H. Ambrose, G. M. Fogg, Geo. R. Knox, W. L. Danley, John X. Williams, A. M. Shook, W. F. Foster, Nashville, Tenn., and S. K. Rayborne, Gunterville, Ala. John W. Thomas was elected President and J. F. Ambrose Secretary and Treasurer.

Tennessee River, Asheville & Coosa.—The following officers were recently elected under the new charter: A. Johnson, President and General Manager; Fred E. Embick, Vice-President and Treasurer, and James A. Embry, Secretary.

Union Pacific.—S. S. Morris has been appointed Assistant Superintendent of the Idaho division, with jurisdiction over the first, second, third and fourth districts, vice H. L. Evans, resigned.

Western New York & Pennsylvania.—The directors have re-elected the following officers: President, C. H. Allen, New York; Vice-President, Samuel G. DeCoursey, Philadelphia; Treasurer, F. S. Buell, Buffalo, N. Y.; Secretary, J. R. Trimble, Philadelphia, and Auditor, William L. Doyle, Buffalo.

Woonsocket & Pascoag.—The officers of the company are: O. Rathbun, President; James P. Ray, Treasurer; F. O. Jilson, Secretary, and B. F. Hancox, Chief Engineer. The office is at 6 South Main street, Woonsocket, R. I.

Worcester, Nashua & Rochester.—At a meeting of the stockholders of the company in Worcester, Mass., Jan. 29, these directors were elected: Charles A. Sinclair, Frank Jones, Portsmouth, N. H.; E. B. Stoddard, Worcester; George C. Lord, Newton; James P. Cook, Salem; Frank A. McKean, John A. Spalding, Charles Holman, Nashua, N. H.; George W. Armstrong, Brookline, Mass.

RAILROAD CONSTRUCTION. Incorporations, Surveys, Etc.

Abingdon Coal & Iron.—The contract will be let shortly for that part of the road between Abingdon and Cumming's Summit, Va. Some grading has already been done between the latter point and Damascus, Va.

Big Horn & Southern.—The surveys for this road have been completed from a proposed connection with the Northern Pacific at Junction City, Mont., south to Sheridan, Wyo. The line follows the Big Horn River to the mouth of the Little Horn, and thence up that river to Pass Creek and to Sheridan. The right of way through the Crow Indian Reservation has been granted by an act of Congress. It is expected that grading will begin in the spring and that the road will be operated by the Northern Pacific.

British Columbia.—Application is being made to the parliament of Canada to incorporate a company to construct a road from Liverpool, B. C., on the Fraser River, westerly through the Delta of the Fraser to a point near Canoe Pass; also companies to build a line from a point on the Mission Branch of the Canadian Pacific, easterly to a point in the municipality of Chilliwack; a line from Spence's Bridge on the Canadian Pacific in a southeasterly direction following the valley of the Nicola River, to the junction of the Coldwater and Nicola rivers, and southerly along the valley of the Coldwater River to its junction with the Voght River.

Buffalo & Geneva.—Work on this extension of the Lehigh Valley is progressing rapidly, despite the weather. The work on the cut under the tracks of the Erie and the Lackawanna roads at Cheektowaga, N. Y., is about two-thirds finished. The masonry work on the line is delayed, but as soon as spring opens it will be pushed. The work is over half finished, and will be completed by September, with the exception of the bridge over the Genesee River, which will be finished about two months later. The grading on the line east of Batavia is more than half finished. West of Batavia the work is in a backward state, but has been pushed during the past 60 days with good prospects of completion by August 1.

Camden & Alexandria.—This road was opened on Jan. 27 from Camden west to El Dorado, Ark., a distance of about 31 miles. The road extends through the Ouachita Valley, and is to be extended to Alexandria, La. The contracts for the first part of this extension will probably be let within a few months.

Canadian Pacific.—The bridge over the Fraser River at the Mission, B. C., is reported as completed. Track-laying over the Mission branch, which is already graded through from Mission to the boundary line at Huntington, has begun, and by March 1 the road will be in operation. By this time the Seattle, Lake Shore & Eastern will be completed to the boundary, and the connection made with the Canadian Pacific.

Cape Breton.—An application will be renewed at the next session of the Dominion Parliament for the incorporation of a company to build a road in the Island of Cape Breton, connecting with the present government line, from Orangedale, in Iverness County, near Why-cocmagh, to Broad Cove coal mines, a distance of 34 miles, thence to Margaree, 20 miles, and also to Chet-camp and Baddeck, Victoria County, 35 miles, all in the County of Iverness. Also for a line from the Richmond coal mines, there connecting with the Cape Breton road, via St. Peter's to Louisburg, 78 miles.

Castle Valley.—The company proposes to resume grading and track-laying from Price, in Emery County, Utah, west to Cottonwood, about 40 miles, as soon as the weather will permit. Nearly half the distance was graded last year and some track was also laid. The entire line to Cottonwood is expected to be in operation before the fall.

Chattanooga Southern.—The entire road will be open for traffic from Chattanooga to Gadsden, Ala., not later than April 15. The entire roadbed has been graded, and track-laying continues on the lower end from Gadsden. Two gangs, one from Gadsden and the other from Pigeon Mountain tunnel, are working toward each other. The line from Chattanooga to the tunnel is in operation. The tunnel is nearly finished, only about one-fourth of the entire distance remaining to be completed.

Chicago, Evansville & Chattanooga.—The survey was begun about Jan. 1 by the Chief Engineer, A. B. Fitch, of Terre Haute, Ind., between Evansville, Ind., and Chattanooga, Tenn. The survey has progressed since that time through Henderson, Ky., to a point about 65 miles south of Evansville. When the survey has been completed to Bowling Green, about 100 miles from the Ohio River, the profiles will be made up and it is then expected that construction work will begin. The survey will not be continued beyond Bowling Green, until most of the work north of that point is done. The road is projected to extend from Evansville to Chattanooga, and is intended to shorten the distance between Chicago and the Ohio River and the South Atlantic States. Two companies have been organized by the projectors; one in Tennessee, the Evansville & Chattanooga, and the other in Kentucky, the Chicago, Henderson, Bowling Green & Chattanooga. L. M. Rice, Louisville, Ky., is President of the Evansville & Chattanooga, and Moses Clift, Chattanooga, is Secretary. The President of the Kentucky Company

is S. K. Sneed, Henderson, Ky. These two companies will be consolidated, probably under the name given at the head of this article. The contract for building and equipping the line has been let to the Kentucky & Tennessee Construction Co., of which J. E. Williamson, Evansville, Ind., is Manager. The construction company will sublet the work in large sections. Subsidies to the amount of \$350,000 have been voted by the towns on the route between Henderson and Bowling Green. No effort has as yet been made to obtain subsidies south of Bowling Green.

Cleveland Belt.—Most of the grading on the west side of Cleveland, O., for the track of this road has been finished, and part of the material for track-laying has arrived. This work will soon be commenced, and the line will be opened in a few months from its connection with the Cleveland & Canton to the Lake Shore & Michigan Southern, in the opposite part of the city. The line is about seven miles long.

Cleveland, Cincinnati, Chicago & St. Louis.—There has been a good deal of difficulty in securing the right of way for the proposed extension of the White Water division north of Harrison, O. It is now stated that all the right of way has been secured, and as the surveys have been completed, the grading can apparently be commenced as soon as the officers order it. The line surveyed is about 39 miles long, from Harrison north across the White Water River, near the Indiana State line, and thence along Johnson's Fork Creek through Sharpstown, Ind., to Richmond, the northern terminus of the extension. Thirty miles of the extension are on a tangent, and it is expected that 25 miles of the line can be built for an average of \$10,000 per mile. The first eight miles from Harrison and the last six miles from Richmond may cost as much as \$20,000 per mile.

Cobourg, Northumberland & Pacific.—The company has begun negotiations with several contractors and construction companies relative to the building of the road from Cobourg, Ont., northeasterly to a connection with the Canadian Pacific, near where it is intersected by the Central Ontario. The distance is about 50 miles, and it is estimated that the road can be built for an average of \$12,000 per mile. The company has been voted a Dominion subsidy of \$160,000, a municipal subsidy of \$100,000, and it has valuable franchises as to right of way over public property and bonding power. These rights it will transfer to the contractors.

Colorado & Northwestern.—H. R. Holbrook, of Pueblo, Col., has been making a preliminary survey of this road for the past month and a half, and the articles of incorporation will be filed next week. The survey has been made from Pueblo, Col., along the south bank of the Arkansas River to Rocky Ford, and thence northeasterly to Kit Carson and to a point on the Chicago, Burlington & Quincy near the State line. The line will be 120 miles long.

Corpus Christi & South America.—The President and other officers of the company have been in New York and the East for a month past, negotiating the sale of the stock and bonds of the company. It is reported they have succeeded, and that about \$10,000,000 of the securities of the company have been subscribed. The grading has been in progress since November or early in December, and the first 25-mile section from Corpus Christi south is now finished. The proposed line is about 150 miles long and the southern terminus will be at Brownsville, Tex., on the Rio Grande River.

Danville & East Tennessee.—The contract for the construction of the road has been awarded to the Interstate Construction Co., of New York. That company has sublet the first division of 30 miles from Bristol east to Damascus, Va., to James P. Edwards & Co., of New York. Work will begin at Bristol. There were 26 bids on the first division.

De Kalb, Aurora & Eastern.—This company filed articles of incorporation in Illinois last week, with a capital stock of \$250,000. It proposes to build a road about 20 miles long, from De Kalb southeast to Aurora, Ill.

Duluth, Pierre & Black Hills.—The directors propose to resume the grading from Faulkton southwest to Pierre, S. D., soon after April 1. This work was done last year between Aberdeen and Faulkton, 44 miles, and it is stated that the Northern Pacific will lay the track on this section in the spring, and also on the 70 miles between Faulkton and Pierre as soon as that part of the road has been graded. The directors claim that trains will be running to Pierre by next October.

Duluth Transfer.—About three miles of this road has been completed in West Duluth, Minn., and it is proposed to resume work in the spring and complete the track on the main line this year. The route is from Duluth along the north shore of the bay and River St. Louis to Fond du Lac, Wis. This main line will be about 20 miles long, but with the various branches and side tracks to the factories and docks and other freight handling points the total amount of track will probably amount to 50 miles. The road is built to provide transfer and terminal facilities for the roads entering Duluth. The projectors also anticipate that a large suburban passenger business will be developed. Three miles and a half of track is now being operated in West Duluth. The work to be done this year will be very expensive. The grading will be very heavy on part of the line. There will be considerable rock excavation, and from five to seven miles of heavy trestling will have to be built. H. J. Fetter, of Duluth, is Chief Engineer.

Easton & Philadelphia.—It is reported that the Philadelphia & Reading has secured control of this company and that it will begin grading in the spring from New Hope north along the west shore of the Delaware River to Easton, Pa. The road will be built as an extension of the Northeast Pennsylvania Division, which has just been completed to New Hope. The further extension to Easton will be about 28 miles long. The surveys have been made and contracts will probably be let in a few weeks.

Erie & Central New York.—At a recent meeting of the stockholders of the proposed line of railroad to connect the New York, Ontario & Western at Norwich, N. Y., with the Elmira, Cortland & Northern at Cortland, the corporate name was changed as above. New directors were elected, who were authorized to issue bonds and build the road at once. The line will be about 35 miles long and some work has already been done.

Geneva & Van Ettenville.—Work has but fairly begun on this extension of the Lehigh Valley. Thirty miles of the road have already been let to Thomas Rickerts, Charles McFadden, and Thomas Collins in

three sections. The remaining 27 miles will be let about Feb. 20. It is intended to revise the lines and take out the curves on the Geneva & Sayre south of Van Ettenville to Sayre, a distance of 17 miles. Bids have not been called for that work yet.

Golden & East Columbia.—This company is applying to the Dominion Parliament for incorporation, giving it power to construct a road from the international boundary, from the upper Kootenay River, northwesterly along the Columbia River to Golden City, and thence to the mouth of the Canoe River, in British Columbia.

Illinois Central.—The report which has received extensive circulation through the daily press the past week to the effect that the Wisconsin Division would be extended from Madison, north to Portage, Wis., a distance of about 28 miles, is denied by the officers of the company, who state that no extension of any division of the system is proposed at present.

Interoceanic.—Hampson & Sullivan have all the grading on the Vera Cruz division now completed, excepting about six miles. The contractors are laying track from both the Vera Cruz and City of Mexico ends of the line, and only about 25 miles of track remains to be laid between Jalapa and Las Vegas to complete the road.

Jersey City, Newark & Western.—This line is one of the extensions of the Lehigh Valley to New York harbor. The road extends from the east side of Pennsylvania avenue, near Concord street, in Newark, N. J., to a point on the property of the National Storage Co., at Caven Point, Jersey City, N. J. Its length is 7½ miles. About two miles of track has been laid on Newark Meadows. The maximum grade is 13 ft. per mile east bound and 26 ft. per mile west bound. The maximum curves are eight degrees. The trestle across Newark Bay is one mile long. Iron bridges are to be built across the Pennsylvania tracks in Newark and across the tracks of the Central of New Jersey in Jersey City, across the Morris Canal and over a number of streets. The contractors for the work on the road are: Elmira Bridge Co., Elmira, N. Y.; Pencoyd Bridge Works, Philadelphia; Edge Moor Bridge Works, Wilmington, Del.; B. M. & J. F. Shanley, Jersey City, N. J.; Ross & Sanford, Jersey City; J. A. Hathaway & Co., Philadelphia, Pa.; P. L. Rehill, Jersey City; J. A. Hodge & Co., No. 44 Broadway, New York; G. W. Rogers & Co., No. 44 Broadway, New York; P. H. Condon, Jersey City, and J. H. & J. R. Byron, Mt. Vernon, N. Y.

Kansas City, Bentonville & Southeastern.—The company has been organized in Missouri to construct a road 16 miles in length from Caverno, in McDonald County, to an intersection with the Kansas City, Fort Smith & Southern at its crossing on Elk River. The capital stock of the company is \$100,000, and J. D. Galbreath, A. C. Walters, J. C. Farmer, W. E. Smith, John Johnson, M. N. Lamance, Pineville, Mo., and L. E. Mitchell, Kansas City, are the incorporators.

Kansas City, Watkins & Gulf.—S. H. Bracey and J. A. Ware, of St. Louis, who are the present contractors, propose to soon resume work on the grading between Spring Creek and Alexandria, La., a distance of about 36 miles. It is claimed that all the tracks will be laid before June 1 on the line from Lake St. Charles north to Alexandria, a distance of 96 miles. About 17 miles of this distance was completed last year.

Kennebec & Farmington.—A bill to incorporate this company is before the Maine Legislature. The road which it is proposed to build is to extend from Farmington easterly to Manchester, and from that point branches will be built from Augusta and to Gardiner, Me. The line will probably be about 30 miles long. Part of the funds for the road will be raised by subscriptions from the different towns, and Augusta has been asked to subscribe for \$40,000 of the capital stock and Gardiner \$25,000.

Lake Superior & Northwestern.—The report is revived that this company will soon let the contracts for the construction of the line from a point near Duluth to the Mesabi and Iron Range mountains. K. D. Chase, of Duluth, is President.

Lower Laurentian.—Thirty-three miles of track has been laid on the section from St. Tite, on the Grand Piles branch of the Canadian Pacific, northwest to Riviere a Pierre, on the Quebec & Lake St. John road. All the grading has been completed on the entire 39 miles of this section. Work is in progress on a few miles where there is some heavy rock blasting. The road is projected to extend from Riviere a Pierre, through St. Tite and Grand Piles, and then southerly on the west side of the St. Maurice River to Three Rivers, Que., a total distance of 73 miles. No work except the survey has been done south of Grand Piles, and the construction of the line south of that point may be abandoned. The Grand Piles branch of the Canadian Pacific connects the two points, and the route of the new road between the two towns is longer than the branch.

Middle Georgia & Atlantic.—The Seaboard Construction Co. was organized at Savannah, Ga., last week to undertake the construction of the proposed line from Atlanta to Savannah, a distance of about 230 miles, of which 40 miles is in operation. Only a preliminary survey of the remainder of the line has been made. The capital stock of the construction company is \$500,000, of which \$300,000 has been subscribed.

Middletown & Cincinnati.—About nine miles of grading has been completed on this road from Middletown, O., southeast. The road has been located to King's Station, Warren County, O., on the Little Miami road, a distance of 14 miles from Middletown. The track has been laid of about seven miles of the line, about half of it having been done in December last. A survey will soon be made from King's Station to a connection with the Baltimore & Ohio Southwestern, about five miles southeast. It has not yet been decided to build beyond King's Station. On the section now under construction the grading is mainly light work. The most difficult work is the Miami River bridge. Some trouble has been experienced in building the roadbed so as to secure proper drainage. The maximum grade is 25 ft. per mile between the Miami River bridge and the Little Miami road, but on the balance of the line 10 ft. is the maximum grade. The maximum curvature is three degrees. The contract for the grading and masonry has been let to F. B. Douglas, Middletown, O. F. J. P. Brackett & Co., Smith Building, Cincinnati, have the contract for all the girder bridges. There are several of these, and they include one 15-ft. span, two 24-ft. spans, two 35-ft. spans, one 50-ft. and one 60-ft. span. The plans for the bridge over the Miami River have been prepared and bids have been asked from the bridge firms. The contract will be awarded in February. The company building the road

is a local one, organized mainly by Middletown manufacturers, and built to secure better railroad connection for their factories.

Nashville, Chattanooga & St. Louis.—The preliminary survey for the extension from Lebanon, Tenn., southwest through Sparta to near Pikeville, Tenn., the present northern terminus of the Sequatchie Valley branch, has been recently completed. The length of the line is about 70 miles. Nothing further has been done since the survey was made, and it is not decided whether the line will be built this year or not.

Nashville & Cumberland Gap.—Some surveying has already been done on this line, recently incorporated to build an extension of the Nashville, Chattanooga & St. Louis to Cumberland Gap, Ky. The line will probably start from a point on the latter road near Lebanon, Tenn. It is reported that the contract for constructing 18 miles of the line between Cookeville and Standing Rock, Tenn., will be let before March.

New Decatur Belt Line.—The Decatur Land & Improvement Co., of New Decatur, Ala., proposes to complete a belt line at New Decatur, by extending the present system of manufacturers' sidetracks. The land company has donated a large tract of ground in the city to a company which has been organized to build a union station in the town. When the belt line company is organized it is intended that it shall control the station and all the terminal facilities, as well as the belt line. J. H. Dowland is Secretary of the company.

Newport & Sherman's Valley.—S. Gring, of Newport, Pa., who has had the contract for building this road, has about completed his work and the line will soon be opened for traffic. The present end of track is at Loysville, Pa., 16 miles southwest of Newport, Pa., but it is proposed to extend the road through Perry County to New Germantown, Pa., a distance of 30 miles from Newport, where a connection is made with the Pennsylvania.

New York & New Jersey Terminal.—The company has filed articles of incorporation in New York. It is to build a road from New York City west to Kearney, N. J. The road will begin at the easterly end of Fourteenth street, in New York, and by tunnels across the city and under the Hudson River to Hoboken and Jersey City to a point near the Hackensack River, thence under the river to the junction of the Delaware, Lackawanna & Western and the Pennsylvania in Kearney, N. J. A branch is proposed from the intersection of Hudson and Fourteenth streets in New York under Hudson street by a tunnel to Chambers street, thence south to the intersection of Wall and Broad streets, and thence underground beneath Broad street to the East River.

New York & Suburban.—This company was incorporated in New York this week to build a road about 15 miles long, from Bronxville, Westchester County, to Jamaica, Queens County. The road is to commence at or near Bronx Park, and extend to and across the East River at Ferry Point to College Point and Whitestone, L. I., thence to Flushing, Jamaica and Woodhaven, there connecting with the lines leading to the city of Brooklyn, the Brooklyn Bridge and the seaside resorts on Long Island.

Norfolk & Western.—The grading was recently begun for a second track to be laid on the Radford division between Radford and Christiansburg, Va., a distance of about 11 miles. With the completion of this work there will be about 27 miles of double track between Roanoke and Radford.

Northern Adirondack.—The company has filed a plan in the county clerk's office of St. Lawrence County, at Canton, N. Y., for an extension of the road from Tupper's Lake to Chain Ponds, thence to the southeast end of Cranberry Lake, and through Colton, Clifton village, Russell and Edwards down the Oswegatchie Valley to Gouverneur.

Ohio & Mississippi.—An extension of the Cincinnati & Bedford branch about two miles long, from the sandstone quarries near Riverdale, Ind., to which the road was built last year is being built. The extension will be completed March 1.

Paducah, Tennessee & Alabama.—The contracts will be let within a few months to build the extension from Paris, Tenn., south to Hollow Rock, about 20 miles. Very few men are now employed on the construction work. About 200 are laying the last few miles of track from the end of track south of the Kentucky State line, to Paris. The maximum grade on this section is 52.8 ft. per mile and the maximum curvature is six degrees. The bridge at Paris is very nearly completed. It is 1,343 ft. long. The average height is 60 ft., and the greatest height being 65 ft.

Providence & Springfield.—A special meeting of the stockholders was held this week to authorize the President to apply to the General Assembly of Rhode Island for such amendments to the charter as will enable the company to issue \$1,000,000 additional bonds for the purpose of redeeming outstanding bonds and for building the extension to Springfield, Mass. The Legislature will also be asked to grant authority to mortgage the road and equipment, and to ratify the lease of the road from Providence to Pascoag and Woonsocket to the New York & New England.

St. Louis & Northern.—Articles of incorporation have been filed in the Recorder's office at Lewiston, Ill., by this company. The proposed line is from the city of Rock Island through Rock Island County, Mercer, Henry, Knox and Fulton, to a point on the Illinois River opposite Havana. It is thought that the road will be merged with the Fulton County and that the gauge will be changed to standard.

Seattle & Montana.—The contractors state they will probably begin tracklaying from Seattle north about Feb. 10. They are now waiting until the bridge across the Skagit River at Davis, Wash., has been erected, which it is expected will be ready next week.

Sebasticook & Moosehead Lake.—A bill has passed the Lower House of the Maine Legislature authorizing an extension of this road from its terminus at Hartland northwesterly to Athens, Me., a distance of about 10 miles.

Southern Pacific.—The extension of the Stockton division through the San Joaquin Valley to Merced, Cal., on the main line to San Francisco, was opened for traffic on Monday of this week. The extension is about 20 miles long. The new line of the Marysville and Knights Landing branch was also opened Feb. 2. The new line has been built on a different route from that of the old road, which was washed away over a year ago, and it is thought to be safe from the recurrence of a like disaster.

The distance between San Francisco and Marysville is shortened about 15 miles.

Staunton Belt Line.—The Staunton Development Co. proposes to build a branch road at Staunton, Va., connecting the Chesapeake & Ohio and the Baltimore & Ohio roads at that point. The stations of these two lines in the town are now about half a mile from each other. The locating surveys have been made and the contractors will begin grading before Feb. 15. The maximum grade will be three per cent. and the maximum curvature 11 degrees. There is to be one wooden trestle 450 ft. long and 25 ft. high. W. E. Miller is President and C. R. French is Engineer of the company which is building the connecting line.

Stuttgart & Arkansas River.—This road was completed last week from De Witt northwest to Stuttgart, Ark., on the St. Louis, Arkansas & Texas, a distance of about 26 miles. The road is now being operated between these points.

Ticonderoga.—Trains began running this week on this short road at Ticonderoga, N. Y., which has been built as a connecting line with the Northern railroad division of the Delaware & Hudson Canal Co. and Ticonderoga, N. Y. The main line is from a junction with the Baldwin branch of that company's railroad to Ticonderoga and is about half a mile long. The total length of the new road is 2¼ miles, including the branches to various mills and factories. The stations on the line are Junction, Lake George Branch, Ticonderoga and De Lano.

Tintic.—This road, with a capital of \$1,000,000, has been organized at Salt Lake City, to extend from Provo to Eureka, Utah, and the Tintic mining district, via the south shore of Utah Lake, a distance of 50 miles.

Tobique Valley.—The contractors for the construction of this New Brunswick road, Kitcham & Co., will shortly resume work. In the meantime the material to be used in the construction of the bridges and the ties required are being secured. When work was suspended, about December last, nearly all the grading had been done and, in addition, rails were laid for a distance of about six miles. There are to be but two bridges at Pokiok and at Big Island, the former having a span of 100 ft. and the latter 200 ft. The road connects with the Canadian Pacific at Perth Centre, and is to be continued to Grand Rapids, N. B., about 14 miles distant.

Toledo, Columbus & Cincinnati.—The tracklaying forces on the line from Kenton south to Ridgeway, O., are now laying about half a mile of track each day. The bridge across the Scioto River, now being erected, may delay the opening of the line. A connection is made with the Cleveland, Cincinnati, Chicago & St. Louis at Ridgeway, which is about eight miles south of Kenton, the former terminus.

Toronto Belt Line.—This company has effected a settlement of the claims of the old contractors, Manning & Macdonald, and closed a new contract with William Hendrie, of Hamilton, Ont., to finish the road by Sept. 1 next. Upon completion the road will be operated by the Grand Trunk on a 40 years' lease.

Washington Southern.—The Satsop road, which is controlled by the Seattle Lumber Co., is to be reorganized under the above name, and articles of incorporation have been filed in Washington. The present road will be repaired and several extensions built, one westerly toward Gray's Harbor on the Pacific, and one northerly toward Port Angeles. Rails for the extensions will arrive at Puget Sound early in April. J. R. McDonald is President, A. H. Anderson Vice-President and General Manager, and George Lawler Secretary and Treasurer of the new company.

Waterloo Junction.—A special meeting of the shareholders will be held at Toronto, Ont., Feb. 24, for the purpose of voting on an issue of first mortgage bonds, the funds to be used in completing the road to Elmira, Ont., and north.

Western New York & Pennsylvania.—The contract for building the Swain's branch has been let to A. C. Barron, of Nunda, N. Y. The line is five miles long, beginning at Ross's Crossing, seven miles from Nunda Junction, to which point a road has already been constructed, and extending to Swain's, from which the track of the Lackawanna & Southwestern will be used.

Wheeling Bridge & Terminal.—The most important work now in progress on this line at Wheeling, W. Va., is the building of the tunnels. That under Chapline Hill is the longest and most important. The contractors are making slow headway, completing only about 90 ft. per month recently on each heading, and it will probably be two months before the headings meet. About 2,000 ft. of the work has been completed, leaving about 400 ft. yet to be excavated.

Wiarion & Owen Sound.—The company has applied to the Dominion Parliament for a charter to construct a road from Wiarion, in Bruce County, Ont., to Owen Sound, or a point on the Canadian Pacific, near Chatsworth, in Gray County, Ont.

Wilmington & Northern.—The Board of Trade of Salem, N. J., is interesting itself in a proposed extension of this road from Penn's Grove through Salem and Bridgeton to Millville, N. J.

Wilmington, Onslow & East Carolina.—Since the beginning of the year the track has been laid on the last five miles to Jacksonville, in Onslow County, N. C., and trains are now running to that point. They have been running from Wilmington to Winona, 45 miles, while the bridge across the New River at Jacksonville was being erected.

Wilmington & Weldon.—The contract for the largest part of the grading on the line between Fayetteville and Rowland, N. C., 35 miles, has been let to the President of the North Carolina Penitentiary, and that part of the work will be done by convict labor. Mayrant & Jackson have the contract for four of the other sections and B. L. Coleman for the remaining section.

Woonsocket & Pascoag.—Some few miles of track has been laid on this road since the first of the year, and the track is now laid between Woonsocket and Harrisville, R. I. The ballasting has been done the past month, and the road is practically ready for operation. It is controlled by the New York & New England, and gives that road a 10-mile connection with the Providence & Springfield road, which it acquired last fall. The contractor for the entire work was E. G. Sweat. William H. Flynn, South Berwick, Me., was the subcontractor on the grading, and John H. Leavitt, Boston, Mass., had the contract for all the masonry work. There is a large amount of bridging for so short a piece of work, includ-

long eight spans of truss bridge and about 800 ft. of pile and trestle bridges. The bridges are of wood (Howe truss pattern), and built of Southern hard pine, and calculated for the heaviest engines now in use. The work was started about July 1, and all grading, bridging and masonry was completed in December, and nearly all the track. The route is practically over part of the old air line that was projected about 36 years ago, and was completed from Boston to Woonsocket. This now forms part of the New York & New England line. The new road begins at the station of the New York & New England in Woonsocket, and extends westerly to Harrisville, passing through the factory villages of Forestdale, Slatersville, Nasonville, Mohigan, Glendale, Oakland and Plainville.

GENERAL RAILROAD NEWS.

Canadian Pacific.—The company reports gross earnings for December of \$1,548,491, an increase of \$282,690 as compared with the same month of last year, and net earnings of \$575,629, an increase of \$35,617. For the twelve months ending Dec. 31 the gross earnings were \$16,552,529, an increase of \$1,541,872 as compared with the corresponding period of last year, and net earnings, \$6,444,049, an increase of \$171,864.

Delaware, Lackawanna & Western.—The annual report gives the following as the earnings and expenses for the year ending Dec. 30:

	1890.	1889.	1888.
Gross earnings.....	\$40,688,645	\$38,247,621	\$43,232,422
Operating expenses.....	32,499,858	30,653,585	33,546,135
Net earnings.....	\$8,188,786	\$7,594,035	\$9,686,287
Interest and rentals.....	5,328,494	5,222,375	5,218,419
Balance.....	\$2,860,292	\$2,371,660	\$4,467,867
Dividends.....	210,019	223,577	967,605
Surplus.....	1,834,000	1,834,000	1,834,000
Surplus.....	\$786,273	\$314,083	\$1,066,262

Chicago, Burlington & Quincy.—The earnings and expenses for December and the calendar year were published this week, and are as follows:

MONTH OF DECEMBER.			
	1890.	1889.	Inc. or Dec.
Passengers.....	\$719,600	\$634,566	I. \$85,034
Freights.....	1,729,319	2,217,467	D. 488,148
Miscel.....	366,813	347,745	I. 19,068
Total gross earn.....	\$2,815,732	\$3,199,778	D. \$384,046
Oper. expen.....	1,738,502	2,005,555	D. 267,053
Balance.....	\$1,077,230	\$1,194,223	D. \$116,993
Fixed charges.....	761,889	744,386	I. 17,503
Net earn.....	\$315,341	\$449,837	D. \$134,496

TWELVE MONTHS, JAN. 1 TO DEC. 31.			
	1890.	1889.	Inc. or Dec.
Passengers.....	\$8,132,416	\$7,927,221	I. \$205,195
Freight.....	23,410,304	22,786,262	I. 624,042
Miscel.....	3,987,866	3,354,135	I. 633,731
Total gross earn.....	\$35,530,586	\$34,067,618	I. \$1,462,968
Oper. expen.....	22,652,516	21,474,608	I. 1,177,908
Balance.....	\$12,478,070	\$12,592,950	D. \$114,880
Fixed charges.....	9,142,672	8,932,627	I. 210,045
Net earn.....	\$3,333,398	\$3,620,322	D. \$286,924

Chicago, Milwaukee & St. Paul.—The company reports gross earnings for December of \$2,453,279, an increase of \$91,480 as compared with the same month of last year, and net \$955,063, a decrease of \$86,127. For the six months ending Dec. 31 the gross earnings were \$15,196,420, an increase of \$405,120 as compared with the corresponding period of last year, and net \$5,629,890, a decrease of \$200,753.

Chicago & Northern Pacific.—Negotiations have been completed for the sale of about \$10,000,000 of this company's bonds to a syndicate of American and foreign bankers. About \$7,000,000 will be taken in this country and \$3,000,000 abroad. The syndicate is to take the bonds within the next 15 months, the money, however, to be advanced as it may be needed. The amount realized for the bonds will be about \$8,000,000. The company owns the terminals of the Wisconsin Central at Chicago and the proposed Calumet Belt line at Chicago. The Northern Pacific through its control of the Wisconsin Central controls this property. It is understood that the proceeds of the bonds will be used to reimburse the Northern Pacific for advances made to aid in building the terminals and the Belt line.

Erie & Genesee Valley.—The arrangement under which the leased lines of the New York, Lake Erie & Western are operated is to be changed, and in carrying out the new policy of "concentration" this road will be sold under foreclosure March 2, in Genesee, N. Y. It extends from Mt. Morris to Dansville, N. Y., about 12 miles, and has been operated by the Erie since 1872 for an annual rental equal to the interest on the bonds.

New York Central & Hudson River.—The following is a statement of the earnings of the company and its leased lines for the three months and half year:

Three months to Dec. 31:			
	1890.	1889.	Inc or dec.
Gross earn.....	\$9,162,456	\$9,531,252	D. \$368,796
Oper. expen.....	6,285,591	6,219,348	I. 66,633
P. c. expens. to earn.....	65.4	65.2	D. .2
Net earn.....	\$3,176,475	\$3,311,904	D. \$135,429
Fixed charges.....	2,114,400	1,965,420	I. 148,980
Profit.....	\$1,062,075	\$1,346,484	D. \$284,409
Dividend.....	894,283	894,283
Surplus.....	\$167,792	\$452,201	D. \$284,409
Six months to Dec. 31:			
Gross earn.....	\$18,526,691	\$19,276,454	D. \$749,763
Oper. expen.....	12,523,501	12,592,531	D. 69,030
P. c. expens. to earn.....	67.5	65.3	D. 2.2
Net earn.....	\$6,003,187	\$6,683,923	D. \$680,736
Fixed charges.....	4,195,410	3,943,701	I. 251,699
Profit.....	\$1,807,777	\$2,740,222	D. \$932,445
Dividend.....	1,788,566	2,235,708	D. 447,142
Surplus.....	\$18,221	\$504,515	D. \$486,294

Norfolk & Virginia Beach.—A stockholders meeting will be held in Norfolk, Feb. 24, to vote on the proposed consolidation with the Danville & Seaboard, under the name of the Norfolk, Albemarle & Atlantic. When the transfer of the road to the new company has been effected the 18 miles between Norfolk and Virginia Beach, Va., will be changed to standard gauge.

New York, Lake Erie & Western.—The following table shows the earnings of the company for last December and for the first two months of the fiscal year compared with the same periods of 1889:

December:				
	1890.	1889.		Inc. or Dec.
Gross earnings.....	\$2,377,635	\$2,187,861	I.	\$189,774
Operating expenses.....	1,938,739	1,566,294	I.	102,445
	\$708,895	\$621,567	I.	\$87,328
Less proportions due leased lines.....	230,189	218,892	I.	11,297
Net earnings.....	\$478,707	\$492,675	I.	\$76,032
Oct. 1 to Dec. 31:				
Gross earnings.....	\$7,694,798	\$7,172,034	I.	\$522,764
Operating expenses.....	5,036,942	4,836,591	I.	200,348
	\$2,567,856	\$2,635,440	D.	\$67,584
Less proportions due leased lines.....	700,139	695,388	I.	4,751
Net earnings.....	\$1,867,717	\$1,910,052	D.	\$42,335

Oshkosh & Mississippi.—The Chicago, Milwaukee & St. Paul, which has owned the majority of the stock of this company for some years, has recently acquired the few shares which it had not previously owned, and the road has been merged with the St. Paul. It has been operated as part of the Wisconsin division of the St. Paul under a guarantee of the interest on the bonds.

Pennsylvania.—The company reports the operations of its lines east of Pittsburgh and Erie for December as follows:

<i>December:</i>		1890.	1889.	Inc. or dec.
Gross earn.....	\$3,305,320	\$5,495,265	D.	\$2,189,945
Oper. expen.....	3,709,206	3,831,024	D.	121,818
Net earn.....	\$1,596,914	\$1,664,241	D.	\$67,327
<i>Year to Dec. 31:</i>				
Gross earn.....	\$66,202,250	\$61,514,435	I.	\$4,687,815
Oper. expen.....	44,980,545	41,096,796	I.	3,883,749
Net earn.....	\$21,221,705	\$20,417,639	I.	\$804,066

The lines west of Pittsburgh and Erie for December, 1890, as compared with the same month in 1889, show a decrease in gross earnings of \$67,508 and a decrease in net earnings of \$184,192. The twelve months of 1890, as compared with the same period of 1889, show an increase in gross earnings of \$4,222,100 and an increase in net earnings of \$1,231,754.

Pittsburgh & Western.—Long reports have been printed in the New York daily papers this week, describing the alleged sale of a majority of the capital stock of this company to the Baltimore & Ohio. It is stated that the stock is to be exchanged for new stock of the Baltimore & Ohio, and that three of the present directors of the road will be elected to the Baltimore & Ohio board. The officers of both roads make a technical denial of the reports, hinting that they probably arose from a renewal of the traffic agreement between the two roads. The lines have worked together in friendly interest, and the advantage in buying the stock is in giving the Baltimore & Ohio control of a line over which a large amount of its traffic is already sent. There seems to be no doubt that negotiations for the purchase have been going on for some time, and the actual control of the Pittsburgh & Western may be transferred after its annual meeting.

Worcester, Nashua & Rochester.—The stockholders have voted in favor of the proposal to issue a new series of bonds to fund the floating indebtedness of the road and to retire the present issue of bonds.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, Feb. 4, 1891.
The Commissioners of the Western Traffic Association completed the preliminary work of organization on Saturday. Their principal work was the division of territory, on which they made a carefully prepared report.

Messrs. J. F. Tucker, Geo. Ristine and A. J. Smith, acting as arbitrators, have heard arguments on the question of whether the Chairman of the Western Passenger Association has the right to demand that the Archibson, Topeka & Santa Fe must submit to him statistics showing commissions paid on transcontinental business originating in the East, the Atchison denying his right to demand them.

The Pass Committee were unable to come to an understanding with the Atchison, Topeka & Santa Fe, and have accordingly announced the dissolution of the agreement. The Atchison protest that they only took the action they did in withdrawing from the agreement because they had evidence that the other members were violating it. The committee, in their notice, state that the information in their possession does not bear out this claim. Negotiations have been carried on since the issuance of the notice, and several meetings of the committee have been held looking toward a resurrection of at least a portion of the agreement. Many of the lines are anxious to save what they can from the ruin, and this may yet be done, although the outlook is not now promising. It is generally conceded that this outcome is most unfortunate, as if the lines cannot be depended upon to keep their minor agreements the prospect for the success of the new Presidents' agreement is by no means flattering.

Consideration has been given the subject of the abuse of tickets issued to drovers, and a committee appointed for the purpose have recommended that hereafter such tickets shall not be good for passage of themselves, but are to be presented to the joint agent at the Stock Yards, who will take up the live stock contract and issue a descriptive, non-transferable signature, continuous-passenger drovers' ticket, good only on train and date punched in the margin.

The Joint Rate Committee have decided that grain originating at points west of the Mississippi River consigned through to eastern points, but stopped off and stored in elevators at Mississippi River crossings, and re-consigned after the expiration of the 72-hour rule, shall be subject to local rates.

The Wabash has announced that it will pay commissions on business subject to the Western Passenger Association, but not on business from St. Louis and Chicago eastward to Toledo and beyond.

The Western Freight and Trunk Line Associations have finally effected a settlement of the rate difficulty via the "Soo" line, and have agreed that rates from the seaboard to St. Paul, Minneapolis and Minnesota Transfer shall be the same as via the differential lines (the Grand Trunk) via Chicago, viz: First class, \$1.20; second, \$1.05; third, \$1.00; fourth, \$1.00; fifth, \$1.00; sixth, \$1.00.

Florida tourist rates are to be restored to tariff Feb. 15.

*This report is crowded out of this issue.

Traffic Notes.

A large shipment of bananas has been taken from Pensacola, Fla., to Chicago in 48 hours.

The Colorado Midland has materially shortened the time of its through trains between Denver and Ogden.

After some months of short hours the Pennsylvania Railroad shops in Altoona are again being run on full time.

The Fitchburg road has issued an order forbidding the hauling through the Hoosac tunnel of tank cars loaded with gasoline or similar explosive oils.

In consequence of the enormous wheat crop in the Pacific Northwest considerable quantities of that grain have been shipped to Minnesota the past season.

The Southern Pacific in Texas has been much bothered by local quarantines against smallpox, vigilance committees with shotguns preventing debarkation at way stations.

The sleeping car between St. Louis and Denver, which has heretofore gone over the Wabash and Union Pacific, is now run from St. Louis to Kansas City over the Missouri Pacific.

The general passenger agents of the trunk lines have resolved to discontinue the sale of circuitous route tickets. This, if thoroughly carried out, will be an important reform in the clerical department.

It is announced that the Philadelphia & Reading will hereafter send its coal to New York Harbor by the Lehigh Valley from Bound Brook to Perth Amboy. This traffic has heretofore gone over the Central of New Jersey from Bound Brook to Port Liberty.

The New York office of the Cleveland, Cincinnati, Chicago & St. Louis (the "Big Four") is to be closed. This step is taken on the ground of economy, the managers of the road being of the opinion that it can safely rely on its Eastern connections for its share of the business.

Judge Dundy, in the United States District Court at Lincoln, Neb., last week, dissolved the injunction against the Union Pacific restraining it from interfering with the two other roads which wish to use the Omaha bridge. The dispatches, however, do not give a clear account of the proceedings, and the controversy between the various companies stands about where it did a week ago.

The Pittsburgh & Lake Erie has demanded that its operators withdraw from the Order of Railway Telegraphers. It is said that the East Tennessee, Virginia & Georgia has taken similar action. It is reported that there has been some sharp discipline on the lines of the Pennsylvania Company in consequence of the unauthorized transmission over its wires of an appeal for funds for the operators who struck on the Chicago, Milwaukee & St. Paul.

The Jacksonville Southeastern Line, which has begun running trains over the Merchants' bridge at St. Louis, though the permanent terminal station and yards in St. Louis have not yet come into use, has already raised a considerable disturbance in rates. Passenger fares have been put at such a figure that the Chicago & Alton has made a rate of two cents per mile for limited tickets between East St. Louis and Jacksonville, and other competitors have had to take similar action. Freight rates to the west side of the Mississippi have been made such that the other roads terminating in East St. Louis (whose rates have heretofore been made to that point only, leaving ferrage or bridge toll to be paid by consignees) have had to make considerable reductions.

Passenger rates to Florida are unstable this season, and the Chicago & Ohio River Passenger Association has been compelled to revise rates three times since Jan. 1. There is now announced a further reduction by the Queen & Crescent to all Florida points based upon a cut of \$21.20 to \$18.50 from Ohio River points to Jacksonville.

The Pennsylvania Company issues the following regulations for the sale of the new \$20 1,000-mile tickets: "You are instructed not to sell to a 'scalper' or his representative, or to any person who you have reason to believe will transfer or sell a ticket for the use of another, contrary to the conditions printed thereon. The purchaser must sign his or her own name to the contract, but if you think that a fictitious name is being given, you will decline to deliver the ticket. Tickets will be redeemed at the rate per mile paid for the same, if presented before its time-limit has expired, under the following conditions: 'When its owner has been unable to ride it out on account of sickness or death; when a business firm or other employer shall have discharged the owner of a ticket for cause; when a business firm whose representative owns a ticket shall stop him from traveling, and desires to send out another man in his place, provided that it is shown that the change thus made is intended to be a permanent one; when the purchaser shall present to the general passenger agent other good and sufficient reasons, and the merits of the case will justify redemption. A mileage ticket will not be redeemed if it has been sold or transferred to another party. No tickets will be sold to firms, companies or corporations, and it should be understood that tickets will only be sold to individuals.'

East-bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, Jan. 31, amounted to 77,344 tons, against 81,661 tons during the preceding week, a decrease of 4,317 tons, and against 95,269 tons during the corresponding week of 1890, a decrease of 17,925 tons. The proportions carried by each road were:

	Wk. to Jan. 31.		Wk. to Jan. 21.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	10,310	13.4	10,211	12.5
Wabash.....	3,849	5.0	4,044	5.0
Lake Shore & Michigan South.....	14,429	18.7	12,885	15.8
Pitts., Ft. Wayne & Chicago.....	8,161	10.6	9,471	11.6
Chicago, St. Louis & Pitts.....	10,202	13.4	8,064	9.9
Baltimore & Ohio.....	5,853	7.3	6,072	7.4
Chicago & Grand Trunk.....	12,191	15.8	14,678	17.9
New York, Chic. & St. Louis.....	8,827	11.4	7,313	9.0
Chicago & Erie.....	3,419	4.4	8,923	10.0
Total.....	77,344	100.0	81,661	100.5

Of the above shipments 5,952 tons were flour, 37,154 tons grain, 3,866 tons millstuffs, 6,296 tons cured meats, 4,061 tons lard, 7,864 tons dressed beef, 829 tons butter, 1,669 tons hides, 110 tons wool and 4,712 tons lumber. The three Vanderbilt lines together carried 43.5 per cent., while the two Pennsylvania lines carried but 24.0 per cent.